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REPORT

OF THE

SECRETARY OF THE NAVY,

BEING PART OF

THE MESSAGE AND DOCUMENTS

COMMUNICATED TO THE

TWO HOUSES OF CONGRESS

AT THE

BEGINNING OF THE FIRST SESSION OF THE FORTY-THIRD CONGRESS.

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THE REGENCY OF THE NAVY

OR

REGENT

REPORT

OF

THE SECRETARY OF THE NAVY.

NAVY DEPARTMENT,
Washington, November 29, 1873.

SIR: The following report of the Navy Department and the naval service for the past year is respectfully submitted:

There are now in the Navy 165 vessels, carrying, exclusive of howitzers, 1,269 guns, which is a reduction, since my last annual report, by sale and otherwise, of 13 vessels. A general enumeration of these vessels presents: 63 steamers, other than iron-clads and tugs, carrying 826 guns; 29 sailing-vessels, 322 guns; 48 iron-clad vessels, 121 guns; and 25 tugs, used for navy-yard and freight purposes. Of this number there are at present in commission for sea-service, distributed on the several foreign stations and on our own coast, 46 vessels, carrying 407 guns. The cruising or active force of the Navy, as these may be called, and which is controlled by the appropriations made and the seamen authorized by law, is about the same as last year, the places of those vessels which have been put out of commission within the past twelve months, from expiration of the cruises or for other causes, having been supplied by commissioning and sending to sea a corresponding number of others.

The list will show a force slightly decreased in numbers by the sale of some useless vessels, which were, while we retained them, only a source of expense, and it is somewhat weakened also in strength by the condemnation and laying up of several of our white-oak cruisers which have reached the limit of their cruising-life and can no longer be used with safety on the seas.

Many of the ships now on the Navy list, and which serve to swell the number to the figures above given, are far from being such as are really needed, and their true condition, which has been often officially represented to Congress, can be fully understood and appreciated by reference to the reports of the Bureaus which are herewith submitted.

In the meanwhile, however, we have been engaged in completely repairing six of our live-oak cruising-ships, which are now in various stages of forwardness at the several navy-yards. These are all of moderate size, and none of them sufficiently advanced to be of present use, but they are adapted to the wants of our cruising Navy, and will in a few months add materially to its strength and efficiency.

The eight new sloops of war authorized by the last Congress are all in process of building—one-half at the various navy-yards, three under contract in private yards, and the remaining one under private contract in the navy-yard at Kittery. The building of these ships, with their engines and machinery, is progressing rapidly, and the work, widely distributed at more than a dozen naval stations and private establishments, is contributing to the remunerative employment of several thousands of workmen, and to the maintenance of the very large number of persons dependent upon their labor for support and education. It is not without gratification that I am able to report that, besides the great value and importance of this work to the service, we have also been able so to utilize the liberality of Congress, as to contribute materially to the business interests of the country and to the support and comfort of many producing and dependent people.

The valuable work thus begun should not be discontinued, but the Department should be provided with a moderate amount of funds and authorized to commence each year to build a certain number of tons, to supply regularly the regular yearly expenditure of naval force which will of necessity occur.

IRON-CLADS.

The work of putting our iron-clad force in efficient condition, referred to in my last report, has been proceeded with as fast as the means necessary for the extraordinary work could be spared from the current appropriations for the support of the Navy. The wisdom of this action needs no illustration from me at this time; without it we would have been left not only powerless to assert our own rights, but almost defenseless against arrogance or aggression; but the expenditure required has crippled our working Bureaus in their general work, and it is necessary that this should be re-imbursed to them if they are to proceed steadily and efficiently.

CRUISING STATIONS.

The stations have been unchanged during the year. As now established, they are designated as the European, the Asiatic, the North Atlantic, the South Atlantic, the North Pacific, and the South Pacific. Over these, embracing the frequented waters of the globe, are scattered a cruising force of less than forty vessels, which by their presence are relied on to encourage our citizens, and, if required, to protect them and their property in all lands to which by their inclination or interests they are drawn.

THE EUROPEAN STATION.—Rear-Admiral A. Ludlow Case commands the naval force on the European station, having succeeded Rear-Admiral James Alden at Villefranche June 2, when the latter transferred his flag from the Wabash to the Brooklyn and returned home, arriving at New York July 10.

The vessels have been actively cruising during the year, and have visited ports of Great Britain, Holland, Germany, France, Portugal, Spain, Italy, Austria, Greece, Turkey, Syria, Egypt, Tunis, Tripoli, Algiers, and Africa, the islands of the Mediterranean, &c.

The disturbances in Spain which called a part of this force to that coast in July last have continued to require the presence of two or three vessels, which have given particular attention to the ports where there were American citizens and interests. They have been under instructions to give full protection to such, and to carefully abstain from interfering in any way with the affairs of the country or its people, except for the protection of our citizens and their property. The position of our commanding officers in that quarter has at times been extremely delicate, requiring the exercise of sound discretion and intelligent action.

In the appendix which accompanies this report will be found a summary of the movements of the vessels on this station and on the others.

THE ASIATIC STATION.—Rear-Admiral Thornton A. Jenkins, who was at the date of the last report, and is still, in command of the force on this station, will soon be relieved by Rear-Admiral E. G. Parrott, who sailed in the mail-steamer of the 1st of November from San Francisco.

Undisturbed friendly relations between our country and the great empires of the East have made the duties and services of our officers and vessels on the Asiatic station peaceful and agreeable. At the same time an increasing commerce, the opening of new avenues of trade, the surveying of uncertain and intricate channels, and the determining and fixing of dangers to navigation have afforded them useful employment, and given an importance and interest to the station surpassed by no other. The vessels have repeatedly visited the ports of China and Japan, penetrated their rivers as far as treaty stipulation and navigation would permit, and with scarcely an exception were received everywhere with good feeling. They have also extended their visits to Singapore, Bankok, Calcutta, and Manila.

The Colorado arrived at New York in March, and the Alaska in February, from this station, and their places were taken by the Hartford and Yantic.

THE NORTH ATLANTIC STATION.—Rear-Admiral G. H. Scott, who is at present in command of the force on the North Atlantic station, relieved Rear-Admiral Joseph F. Green at Key West, May 15, and the latter returned to Boston in the Powhatan, arriving May 27, and hauled down his flag.

The force on this station was reduced in the spring and summer by ordering north, as a necessity, some of the vessels, which were much in need of repairs and whose crews needed a change, having been long in the tropics. The Shawmut and Nipsic, two of the smaller but active class of vessels, came north in June, and the Richmond was about the same time, transferred to the North Pacific station. The Kansas was

until July co-operating with the Nicaragua surveying expedition, but, at the same time, her repeated visits to Aspinwall enabled her to give full protection to our interests in that quarter.

Notwithstanding this reduction, important and useful cruises have been made, and our flag has been shown at almost all the commercial ports, or where there were American interests, in the Gulf and on the Caribbean Sea; many of them have been visited repeatedly, viz: St. Thomas, Santa Barbara, San Domingo, Port au Prince, Jacquemel, St. Nicholas Mole, Cape Haytien, Gonaives, Aux Cayes, San Juan, (Porto Rico,) Gaudeloupe, St. Pierre, La Guayra, Puerto Cabello, Curaçoa, Santa Martha, Carthagena, Aspinwall, Greytown, Vera Cruz, Kingston, Havana, Matanzas, Nuevitas, Santiago de Cuba, Guantanamo, and Bermuda.

Assistance has been offered, and extended when required, to our commerce and citizens, the commanding officers have been in constant communication with our ministers and consular representatives, our interests on the Isthmus have been watched, and a vessel, almost constantly stationed on either side, has been in readiness to protect the railroad if occasion should demand. Convoy has been afforded to the merchant service when menaced and threatened with unlawful seizure and violence.

In addition to these appropriate and legitimate duties of our ships of war on the North Atlantic station, they have been engaged, as occasion permitted, in important hydrographic surveys both on our own and neighboring coasts, securing important data for the benefit of commerce, and have aided, to a limited extent, submarine telegraphic enterprise.

THE SOUTH ATLANTIC STATION.—The force on this station is under the command of Rear-Admiral James H. Strong, who took passage in the steamer of September 23 from New York, and relieved Rear-Admiral William R. Taylor at Rio de Janeiro, October 24, hoisting his flag on the Lancaster. Rear-Admiral Taylor is returning home by mail-steamer.

Nothing has transpired to require an increase of the force on this station, which is now, and has been for several years past, at the lowest possible figure.

The Monongahela, which sailed from Newport on November 12, has taken the place of the Ticonderoga, which has already started for home. The vessels on this station, few in number, have been sufficient for all purposes, as the relations between our country and the countries with which the command has intercourse have been pleasant and friendly; and ample security has been extended by the authorities to American citizens engaged in commercial pursuits or sojourning in that quarter.

The usual cruising has been carried out, and the ports of commerce on the coast visited by the larger vessels on the station, while the Wasp has ascended the navigable streams of Uruguay and Paraguay, facilitating the movements of our diplomatic representatives and encouraging American residents in the interior.

Merchantmen in distress, whether of our own or other nationality, have received every assistance in the power of our vessels to afford; and it has been their good fortune to relieve several during the year. While not engaged in other more important business, the time has been usefully improved by contributing valuable hydrographic results by surveys conducted under instructions from the Bureau of Navigation.

THE NORTH PACIFIC STATION.—Rear-Admiral A. M. Pennock commands the naval force on the North Pacific station, with the Saranac as his flag-ship and San Francisco as his headquarters. His flag was transferred from the California June 28, and the latter vessel was put out of commission.

The movements of the vessels on this station have, during the year, extended to the Sandwich Islands, our possessions on the northwest coast, and the coast of Mexico and Central America.

The death of His Majesty the King of the Sandwich Islands, information of which was received late in December, and the changes which would naturally follow so important an event, suggested the propriety of the admiral visiting Honolulu, and he proceeded to that port at once, arriving January 15. In the mean time a new King had been chosen, a new ministry selected, and the government in the course of harmonious action. The Hawaiian flag was promptly saluted, and a gratifying exchange of visits and courtesies immediately followed. Later, His Majesty visited the California, and upon the invitation of the admiral availed himself of the opportunity of visiting some of the islands of his dominion by a passage in the Benicia, which was temporarily made the flag-ship of the station. Rear-Admiral Pennock returned to San Francisco in May, and in July proceeded on a northern cruise. Victoria, Esquimault, Sitka, Port Townsend, Olympia, Seattle, and Steilacoom were visited, as well as some other places of less importance.

Interviews were held with the Indians of Alaska, many of the chiefs of which visited the ship, and the occasion was availed of to impress them with the importance of maintaining the friendship of our people; and also to reconcile differences which had long existed between the principal tribes, which they were anxious to settle. The flag-ship returned to San Francisco September 29, and on the 7th of October following proceeded to the Sandwich Islands.

Other vessels of this command have shown the flag at ports in Costa Rica, Nicaragua, San Salvador, Guatemala, Honduras, Mexico, and Colombia, at all of which our commercial relations were undisturbed and the feeling of the officials and citizens represented to be of the most friendly character.

THE SOUTH PACIFIC STATION.—Rear-Admiral John J. Almy succeeded Rear-Admiral Charles Steedman in the command of the naval force on the South Pacific station, at Panama, September 22, hoisting his flag on the Pensacola.

This station includes the islands and waters of the Pacific south of the

equator, as far west as the one hundred and fiftieth meridian, and the coasts and sea-ports of Australia; but in consequence of the disturbed condition of the State of Panama, where there have been serious outbreaks, and the prosecution of important hydrographic surveys, the visiting of these distant quarters has been omitted during the year.

Within the limits of this station only two occasions have arisen where it has been necessary to land a force from our vessels for the protection of American citizens and property, and on each of those occasions the landings were made on the same territory, at the request or with the permission of the authorities, or under an admission, on their part, of their inability to promise the security and protection due from them.

Rear-Admiral Steedman, on arriving at Panama, May 7, found hostilities in progress between the opposing parties contending for possession of the government of the State of Panama, and, at the request of the United States consul and a number of influential American and other foreign citizens, sent on shore a force of two hundred sailors and marines, with four pieces of artillery, which were equally divided between the city and the railroad-station. This force was landed from the Tuscarora, which had prepared for responding to the signal for protection the evening before the arrival of Rear-Admiral Steedman, and from the flag-ship Pensacola. It was withdrawn from the city on the 11th, and from the depot on the 22d May, all differences having been settled.

The second landing was made September 24, under the order of Rear-Admiral Almy, the revolutionary movements having been renewed. A force of one hundred and thirty men, well armed and equipped, with howitzers, was stationed at the depot, and it was afterward increased to one hundred and ninety men, and detachments posted to protect the American consulate, and other American houses and American property. The authorities on this occasion gave notice of their inability to give the protection guaranteed by treaty. The landing parties were from the Pensacola and Benicia, the latter vessel belonging to the North Pacific station. Hostilities ceased October 8, and the force was withdrawn, excepting a detachment of thirty men, which was left a few days longer to guard the depot and the railroad should the troubles revive.

The landing of these detachments during the two emergencies, while quieting the fears of foreign residents, secured the safe transit of the passengers and their effects, and of the freight and specie of four lines of steamers, two of which were not of our nationality, depending on this road for prompt transportation.

The officers and men who composed the landing parties received the commendation of their respective commanders-in-chief for the creditable and admirable manner in which they discharged their duty. The commercial ports on the west coast of South America have been visited by the vessels of the South Pacific station, and some of them by vessels en route to the North Pacific station. With the exceptions above mentioned their proceedings have not been different from those common to

our cruisers frequenting the waters of friendly nations; and the exchange of courtesies between our officers and the authorities and other residents appears to have been mutually gratifying.

MISCELLANEOUS.

In addition to the vessels which have constituted the regular force of the several stations, others have been usefully employed on special or separate service.

The Portsmouth has been engaged in surveying reported dangers and islands in the Pacific, on the highways of commerce, the existence or position of which has not been clearly established or definitely fixed. The Narragansett has been examining the route pursued by our merchant steamers along the Californian and Mexican coasts, for the promotion of safer navigation. The Tuscarora has conducted a series of soundings along and off the northwest coast, to determine a suitable bed for a submarine telegraph-cable between the United States and Asia; the Michigan has cruised on the lakes for the assistance of the merchant marine, or for any other emergency; the Juniata has visited the Greenland coast in search of the Polaris; the Blue Light has been at the disposal of the United States Commissioner of Fish and Fisheries on the coast of Maine; the Guard and Supply have carried out the articles of American exhibitors to the Vienna exposition; and the Constellation and Fortune have made the usual summer cruise with the cadet midshipmen and cadet engineers respectively.

In addition to the regular service, we still supply from the number authorized by law for the Navy the men and officers for the Coast Survey, and officers for light-house duty.

We have also completed, during the past year, two further surveys of the great Isthmus, and have made constant and extensive ocean soundings and surveys in the interest of science and commerce.

INTEROCEANIC CANAL.

The expeditions organized under the authority of Congress for the survey of the Darien and Nicaragua routes, with the view to the construction of an interoceanic canal, have completed the duties intrusted to them, and the reports of Commander Thomas O. Selfridge and Commander E. P. Lull, who respectively conducted the surveys, are herewith submitted.

The return of these expeditions, with full reports of their results, seems to leave little more to be done in the direction of isthmus surveys; and in the now completed explorations, most creditable to all engaged in them, the Department feels assured that the resolutions of Congress which led to the same have been carried out in the spirit in which they were conceived.

The results of these two last surveys may be summed up as follows:

DARIEN SURVEY.—The favorable report of Commander Selfridge of

the survey of the Isthmus of Darien, in 1871, rendered it desirable to explore more thoroughly the region of the Napipi, and to definitely settle how far the surveys to the south could be profitably carried on in the valley of the Atrato.

Commander Selfridge was accordingly ordered to organize another expedition, which arrived in Panama in January last. The Tuscarora, Commander Belknap, of the Pacific fleet, was ordered to co-operate with it, and form a base for the desired surveys.

It is very gratifying that the expedition has been so successful as to materially improve upon the route already discovered and surveyed, and has marked out a line for this great enterprise that can be constructed within the limit of an expenditure more moderate than could have been expected, when compared with the immensity of the undertaking, and the great benefits that cannot fail, upon its completion, to occur to our commercial interests.

Briefly stated, the route selected by Commander Selfridge includes one hundred miles of river navigation of the Atrato, which has been carefully sounded, and found to be fully capable of being navigated by the largest class of ocean-steamers. Between Atrato and the Pacific a canal or artificial cut is made but twenty-eight miles in length. The canal for twenty-two miles of this distance passes through a plain, with a gradual rise of 90 feet. There will then remain six miles to the Pacific, of which there are a moderate open cut and three miles of tunneling. It is estimated that the work will cost between $50,000,000 and $60,000,000, and that it can be completed within ten years.

A careful survey and soundings of the Atrato resulted in the fact that, though capable of navigation for steamboats, even in its lowest stage, to Quibeto, the head of ship-navigation was reached but a short distance above the line selected for the canal.

Surveys of the interior settled the fact that it would not be profitable to explore south of the Napipi; not only because the westerly trend of the coast made the area that would have to be canalized broader in extent, but also that it was traversed by numerous streams, forming the water-shed of mountainous ridges that would have to be cut transversely. Moreover, the Cordilleras, which present a marked depression near the head-waters of the Napipi, increase rapidly in altitude as you proceed south.

The health of the expedition has been as satisfactory as the preceding ones.

These surveys, which include the whole Isthmus of Darien, have not resulted in the loss of a single life through climatic causes. Much of this immunity from disease in a sickly climate and an arduous duty is due to the provident care and well-laid plans of the officers in command.

NICARAGUA SURVEY.—The Nicaragua surveying expedition, in charge of Commander E. P. Lull, sailed from the United States in December, 1872, and returned in July last. The results of its labors prove the existence of a practicable route for an interoceanic ship-canal, having

Lake Nicaragua at its summit level. It is proposed to connect the lake with the Pacific by a canal 16.33 miles in length, beginning at the mouth of the Rio del Medio, and terminating at Brito. The first 7.50 miles will require an excavation averaging 54 feet in depth, and will be the most expensive part of the whole work. The profile for the rest of the distance is lower than the proposed level of the surface of the water; embankments will be built up with the material excavated. Ten locks and one tide-lock will be required between the lake and the sea. There will be fifty-six miles of lake navigation; 26 feet of water can be carried within 1,350 feet of the mouth of the Rio del Medio. On the east side a channel will have to be deepened, from 6 to 8 feet, for nine miles. The bottom is a firm mud without a single rock.

Slack-water navigation in the San Juan, from its head to the mouth of the San Carlos, is considered perfectly feasible; and it is proposed to improve the river by four dams, one each at Castillo Rapids, Balas Rapids, Machuca Rapids, and at the mouth of the San Carlos, at all of which places excellent locations for dams exist. A short section of canal with one lock will be required to get around each of the upper three dams. From just above the fourth dam to Greytown an independent canal will be required, 41.90 miles in length, of which thirty-six miles will require an excavation less than the prism of the canal; the remaining four miles are made up of short reaches, where the line cuts through hills. Seven locks, besides those abreast the dams, will be required, and should be located in the hills in order to take advantage of the natural rock foundation. Some improvement will be required in places in the river-bed, for which the amount has been computed and the cost estimated.

The total length of the proposed canal is 61.74 miles, of which 47.37 miles are in excavation and embankment. The average depth of excavation throughout is but 9 feet above the prism of the canal. No tunnel is required. The harbor of Greytown has been partially destroyed by a silt which comes from the San Carlos, and others of the lower tributaries of the San Juan, and the branch of the river leading to Greytown has become so much filled up that it is now, at the lowest stage of the water, but 324 feet wide and 6 inches deep at the fork. It is proposed to shut off this branch entirely and send all the silt-bearing water through the Colorado mouth, which empties into the sea eighteen miles from Greytown, and to admit to the harbor only the water of the canal, which being drawn from the main river above the mouth of the San Carlos will be perfectly clean. The harbor then once cleared out, will leave nothing to deteriorate it again.

A short breakwater will be required to protect the entrance from the surf, also one at Brito, both of which are included in the estimate for the work.

Careful gauges at the lowest stage show that Lake Nicaragua will supply thirty-eight times the maximum possible demand of water.

The climate is considered perfectly healthy for temperate people who adopt the simplest sanitary precautions. Part proof of this is that not a man has been lost in either of the expeditions lately operating in the country, though constantly subjected to severe labor and exposure.

THE POLARIS.

In my annual report of November 25, 1871, I communicated the latest information then known of the proceedings of the expedition toward the north pole, in mentioning the departure of the Polaris from Upernavik, Greenland, on the 18th August, 1871.

From that time no tidings from the Polaris were received until the 9th of May, 1873, when, by a telegraphic dispatch, the consul of the United States at Saint John's, Newfoundland, apprised the Department of State that nineteen persons, late of the Polaris, had been rescued from the floating ice in Baffin's Bay, by the British sealing-steamer the Tigress, and that they had safely arrived at that port.

The Department dispatched the United States steamer Frolic from New York to Saint John's to receive these persons and to bring them to Washington. The Frolic accomplished this mission without delay, and on the 5th of June arrived at the navy-yard, having on board two of the officers, eight of the crew, and nine Esquimaux, five of whom were children, all in good health.

For the reasons stated in my report to you of the 17th of June last, I deemed it advisable that I should hold an examination of these persons, and, accordingly, with my associates named in that report, such examination was carefully made, and the result communicated to you in our joint report of June 16. Both of these reports and the testimony of the witnesses, with the diaries of several of them, are published in the appendix to this report, and present a most interesting history of the voyage and discoveries of the Polaris up to the time of their accidental separation from these hardy mariners on the night of October 15, 1872, and of their own subsequent sufferings and adventures during the one hundred and eighty-seven dreary days of their drift among the ice.

Of the Polaris herself nothing more was known until September 19, 1873, when the arrival of the British sealing-steamer Arctic, at Dundee, Scotland, with six of the officers and three of her crew on board, was telegraphed to the Department of State by the United States consul at that port, with the further information that the remaining officer and the other two seamen would soon follow; all hands of the Polaris having been picked up by the British whaling-steamer Ravenscraig on the 23d of June, south of Cape York, off the Greenland coast, while on their way in boats to the southward, the Polaris having been abandoned as a wreck.

As mentioned in my report to you of the 16th of June last, the Juniata, under Commander Braine, and the Tigress, under Commander Greer, were dispatched from New York as soon as they could be pre-

pared for such service to search for the Polaris, and this duty was promptly and faithfully performed; but, happily, the British whaling-ships were on their cruising-ground early enough to rescue the whole party almost as soon as their boats rounded Cape York.

From the captain, officers, and crew of the Ravenscraig, Arctic, and Intrepid, all British sealing-steamers, these survivors of the Polaris received the kindest and most hospitable welcome and the most generous treatment, and I take great pleasure in recommending that a suitable acknowledgment be made to them for their humane and generous conduct.

On the arrival in this country of these nine persons, they also were brought to Washington and examined by myself and the same associates as on the former occasion. Awaiting the return of the three remaining persons, this investigation has not been completed as yet, and the report is withheld until an opportunity offers to do so, when it will be submitted and printed.

To these reports, to the narrative of the expedition which will be prepared in due time for publication, to the scientific history of the results obtained in that department, and to the map in course of construction, I must leave the full development of all matters connected with this most interesting voyage toward the northern pole, made under the flag of the United States.

I may, however, state in general terms that the cruise of the Polaris has been decidedly the most successful of arctic expeditions. The geographical knowledge of the arctic regions has been largely advanced. The ship herself, in two months after her departure from New York, attained the latitude of 82° 16′ north, a position far beyond the limits of all previous navigation toward the pole, and the exploration of Captain Hall and of the officers, and of the scientific gentlemen upon the land, have all that singular interest which accompanies the examination of regions heretofore unknown to civilized man.

The only death which occurred during the expedition, from first to last, was that of its commander, Capt. Charles F. Hall.

A very particular questioning of every one of the officers and crew of the Polaris and of the scientific corps (except the three persons as yet unexamined) has completely satisfied my associates and myself that his death occurred from purely natural causes; that his medical treatment was judiciously adapted to his case, and that he was tenderly nursed and cared for to the last.

The evidence has also made it manifest that Captain Hall was always faithful to the trust reposed in him in assigning him to the command of the expedition; that he was kind, firm, and humane in the exercise of his authority; that he was earnest in his desire and in his attempts to reach a high northern latitude, and if practicable, the pole itself, and that his untimely death was an irreparable loss to the expedition.

It is also apparent that Captain Buddington, who succeeded to the

chief command on the death of Captain Hall, proved himself to be a good seaman, and that in all the dangerous positions in which the Polaris was placed, his conduct as her commander, was skillful and judicious, the natural result of a good judgment and of long experience at sea and in command in northern latitudes.

The domestic history of the expedition, as developed by investigations, was, on the whole, as harmonious as might have been expected. Obedience was maintained, and good order was generally preserved on board.

The ship herself proved to be exceedingly strong, and capable of resisting a very heavy pressure of ice. Had she been of less strength she would have been crushed and wrecked on occasions prior to October 15, 1872. The testimony is clear and unanimous on this subject, and is also conclusive on another vital point, that she was well found in provisions and stores for an arctic voyage. Her steam-machinery worked satisfactorily, and was in good order when she was run aground, on the 16th October, 1872, the day after she broke adrift from the ice-floe.

The injuries she received on the night of the 15th October, in addition to former hurts, proved fatal, and she was with great difficulty kept afloat until she could be beached on the next afternoon. During that day, notwithstanding that a lookout was kept for the missing people upon the ice, nothing was seen of them from the ship; and if they had been seen she could not have gone to their rescue.

The Polaris was beached in a sinking condition, at Life-boat Cove, near Littleton Island, in latitude 78° 23′, a place visited by Kane and Hayes, in former years.

Friendly Esquimaux soon made their appearance with dogs and sleds and aided greatly in transporting stores from the ship to the shore, and kindly relations were kept up with these people to the last.

Constructing a house out of material supplied by the Polaris, the winter and spring were passed in comparative comfort. When the sun appeared in February the building of the boats, from the planks of the Polaris, was begun, and they were completed in time for the whole party to embark in them, with all of the records and specimens they could carry, as soon as the state of the ice would permit.

On the 3d of June last they abandoned their house, leaving nothing in it of any value whatever, and after an adventurous, but not very dangerous, voyage of 20 days, were picked up by the Ravenscrag, as before stated.

SEARCH FOR THE POLARIS.

The rescue of a portion of the officers and crew of the Polaris, and their return to St. John's, N. F., by the Tigress, a whaler of the Arctic Seas, and through whom intelligence of the disaster to the Polar expedition and of the death of its lamented commander was received.

gave hope that, although perilously situated, the remainder of the officers and crew, and the vessel itself, might, by prompt measures, be restored to their friends and country. As soon, therefore, as all necessary facts and information could be obtained, steps were taken to send out immediately an expedition to search for the vessel and party. The Tigress, which was well suited for such a purpose, far more so than any vessel we possessed, was procured for this service, brought to New York, and equipped, officered, and manned as soon as possible. At the same time the Juniata was made ready to proceed to the coast of Greenland and facilitate the movements of the Tigress, by carrying coal and other supplies, for which the latter had not sufficient capacity, and prosecute the search herself as far as was prudent for a vessel not built or strengthened for arctic navigation. Commander D. L. Braine was in command of the Juniata, and Commander James A. Greer was assigned to the command of the Tigress.

The orders to the Tigress were to make her way, if necessary, by every means possible and in the face of every danger, to the spot where the Polaris was last seen; those to the Juniata, which vessel was not so well fitted to encounter the ice, were to advance no farther in that direction than she could do without incurring more than ordinary risk and danger, and to aid in every possible way the special object of the Tigress. The orders in each case were promptly and ably executed, and on this hazardous and laborious service the officers and men exhibited commendable zeal and energy. The movements and proceedings of the vessels and commanders were as follows:

The Juniata, Commander D. L. Braine commanding, which sailed from New York June 24 for the arctic regions in search of the Polaris, returned to that port October 24. Some necessary changes were made in her condition, such as the reduction of her armament and complement of men, the sheathing of her bows, &c., to increase her carrying capacity and strengthen her to contend against the ice. She was coaled to the utmost to supply the Tigress and meet her own consumption, and after rather a hazardous passage, amidst fogs and icebergs, reached Fiskenaes, Greenland, July 14, having touched on the way at St. John's, N. F. She continued her voyage along the coast to the northward, stopping at Sukkertoppen and Holsteinborg, at which latter place the necessary dogs, skins, &c., for the use of the officers and men of the Tigress were procured, and reached Godhavn, island of Disco, July 21. Leaving there July 29, she pushed on through innumerable icebergs and rocks, and arrived at Upernavik July 31, at which port the governor stated that within his recollection of over thirty-five years no vessel of half the size of the Juniata had ever been.

From this place the steam-launch Little Juniata, under command of Lieutenant-Commanding Geo. W. De Long, with other officers and men, all volunteers for the occasion, equipped with sixty days' provisions and fifteen days' coal, sailed August 2 for Cape York, in search of the Polaris

and her crew, performing one of the most extraordinary voyages on record, and returning August 12. Off Tessiusak she communicated with the Tigress. August 13 the Juniata left Upernavik and proceeded south to Godhavn to meet the Tigress, which had been previously supplied and coaled. The time here waiting the arrival of the Tigress, or news from her, was profitably spent in searching for coal. The whaleboat and the launch were employed in this service, under competent officers, and several veins of coal of a bituminous nature were found running longitudinally through the mountains in latitude 69° 45′ north, longitude 52° 20′, from which supplies were procured. The Tigress arrived at Godhavn August 25; was again coaled; and on the 31st August the Juniata sailed for St. John's, N. F. Here she prepared for a renewed search for the officers and crew of the Polaris, and sailed again for the arctic regions September 18. The same evening telegraphic intelligence, received by the United States consul at St. John's, Mr. T. M. Mulloy, from Dundee, reported the arrival of the Polaris party at the last-named port, and with great promptness and discretion he immediately chartered a steamer, overtook the Juniata, and she returned to St. John's. She awaited the arrival at that port of the Tigress, October 17, and then returned to New York as above stated.

The Tigress sailed from New York July 14, touched at St. John's, and arrived at Godhavn August 6. She coaled and left August 8, and reached Upernavik August 10. She there received from the Juniata skins, coal, &c., and proceeded northward the following day, communicated with the Juniata's launch off Cape York, skirted the shore as closely as navigation would permit, examined North Star Bay, Northumberland Island, Hartstene Bay, without success, and August 14, one month after leaving New York, discovered at Littleton Island the camp which the Polaris people had occupied the previous winter. From the natives then in possession of it, information was obtained of the departure in June, all in good health, of Captain Buddington and party southward in boats constructed from the ill-fated Polaris, which subsequently sunk. Such papers, instruments, &c., as were found in the camp, and were of any consequence or value, were secured by Commander Greer, and the next day the Tigress stood toward the south. She passed Cape York, anchored in Melville Bay, communicated with the authorities at Tessiusak, and arrived at Godhavn August 25. She was again coaled by the Juniata, and immediately resumed the search. She ran over to the west coast, thence southward to the entrance of Cumberland Sound, back to the coast of Greenland, in the vicinity of Ivigtut and Fiskenaes, searched in Davis Strait as long as her coal lasted, and then proceeded to St. John's, at which port she arrived October 16, and learned of the rescue and arrival in Scotland of Captain Buddington and party. She left St. John's October 30 and reached New York November 9.

The Department takes this occasion to express its indebtedness to

the officials of the Danish government in Greenland for their uniform courtesy to the officers of the United States Navy connected with the recent expeditions to the Polar Seas, and for the facilities extended to those expeditions to promote their success.

TRANSIT OF VENUS.

The liberal appropriations made by Congress for making observations on the transit of Venus have been in part expended for the purchase of instruments. Five points will be occupied in the southern and three in the northern hemisphere. These observations are of so much scientific importance that it is my intention, under any eventuality now considered, to furnish naval transportation to the several parties designated, and such other facilities as may be practicable.

HYDROGRAPHIC OFFICE.

This office is steadily and surely progressing in its usefulness in the interests of navigation; as its issues of charts and books increase they are gradually taking the place of foreign publications, and some of its works are now much sought for abroad. The Pacific survey, originated in this office, under the Bureau of Navigation, will, as executed, be a great benefit, not only to the commerce of the United States, but to that of the world, and secondary to the survey, much information will be acquired in the various branches of natural science. The establishment, by electric telegraph, of the longitudes of the islands of the West Indies and the points on the northern coast of South America to which the cable has been laid by a party organized and instructed at this office, will make a most desirable addition to geographical knowledge and to navigation. I refer you to the report of the hydrographer to the Chief of the Bureau of Navigation, and recommend that two additional small vessels be employed in surveys, one in the West Indies, the other in Asiatic waters; in this we not only take, in common with other maritime nations, a part in the exploration of the channels of commerce, but give at the same time practical experience to the junior officers of the Navy in a most important branch of their profession.

Again I would call your attention to my recommendations in my previous reports, and I urgently recommend that an appropriation be made for the purchase and fitting a building permanent and suitable for the Hydrographic Office. I do not consider the rented building, at present occupied, as either suitable or safe in its present condition.

NAVY-YARDS.

I beg to renew the recommendations made in my annual reports of former years, in reference to our navy-yards, and to urge that their resources may be increased and developed to meet the emergencies of those wars to which even the most peace-loving nations are liable, and

which are best averted by a readiness for action should they be thrust upon us.

At the most of our navy-yards little could be done during the past year beyond making the repairs necessary to keep them from falling to decay.

At Mare Island, our only naval establishment on the Pacific, the new dry-dock, and the iron-working shop for construction, are well in hand and will add largely to its resources. We have great naval interests on the Pacific, and I cannot too strongly express the hope that Congress may strengthen them by liberal appropriations to develop this admirably placed arsenal.

League Island.—At League Island, in obedience to the injunction of Congress, the work of removing to it the material and stores of the old Philadelphia navy-yard has begun. The heavy ordnance, shot, and cannon, the anchors and chain-cables, and a portion of the ship-building timber are already transferred. A massive machine-shop and store-house for yards and docks has been built, and the foundation of a still greater establishment for construction has been begun. It is conclusively determined that there is no difficulty in finding a perfectly secure foundation at moderate cost, and that such a foundation at League Island will be no more costly than at New York or Norfolk, or other of our sea-board navy-yards. It is time that we should cease to have two navy-yards at Philadelphia, and that the narrow and cramped yard so much needed by the city for its commerce should be transferred to the grand and better site bestowed by Philadelphia, and accepted by Congress with its implied obligations. I beg to renew my recommendation that Congress may cause the old navy-yard to be valued, and that it advance the sum expected to accrue from its sale, instructing the Navy Department to expend the amount thus appropriated, within four years, on such buildings and improvements at League Island as shall authorize the abandonment of the old yard. The Treasury may then, by its sale, be reimbursed for the money advanced to create the new establishment.

New York.—I am impelled by recent experience to say that I trust that no legislation may interfere with the preservation of the New York navy-yard in its present site and in its integrity. The present moment shows in the clearest manner how invaluable this yard is to the Navy in utilizing in a time of emergency the vast naval resources of construction, equipment, and repair which its central position enables it to draw from the ship-yards, docks, machine-shops, and stores of the great city that surrounds it, teeming with a population of skilled artisans.

Pensacola.—I think it very important that the Pensacola navy-yard, burnt during the rebellion, but with many of its improvements unharmed, should be in some degree rebuilt. In the event of complications in, or near, the Gulf of Mexico or West Indies, it would be a station of vast importance.

New London.—I again call attention tothe obligations of the Government in regard to the naval station at New London, in Connecticut.

We are the owners, by gift from the State, of a large and valuable property at this place, which has never been utilized for want of adequate means appropriate for the purpose. The considerations in favor of this site have been frequently presented, and I will only add that all that we have done there in the past has been done so well and so cheaply as to give an earnest for the future, and induce the belief that a well-found and supplied naval station at this point would be extremely valuable to the service and to the country.

ORDNANCE.

The report of the Chief of the Bureau of Ordnance, though brief, is highly interesting and satisfactory, especially with reference to the great advancement made in the manufacture of gunpowder and the perfection attained in the production of a suitable cartridge for small-arms.

The operations of this most important branch of our naval service have been closely confined within the appropriations, the narrow limits of which prevented any elaborate experiments being made in testing the manifold improvements which occupy the attention of ordnance men abroad.

The Bureau has, nevertheless, been extremely vigilant in collecting the necessary data to enable it to proceed intelligently in the solution of any of the great questions relating to naval armament whenever Congress may grant the requisite authority and supplies. In the mean time its resources are sufficient for the armament of every ship which can at present be placed in commission. Nothing in its economy appears to have been neglected, and it only remains to increase its efficiency by a liberal appropriation. Otherwise nothing, practically, can be done to keep pace with the movements of European navies.

Unquestionably the efficiency of a man-of-war is measured by the power of her battery, and the respect paid to our flag is in a direct proportion to the number and caliber of the guns which defend it.

I most earnestly recommend that ample provision be made for the support of this Bureau in order that nothing may interfere with its efforts to arm our ships with the most powerful guns.

NAVAL PENSION FUND.

Statement of the number and yearly amount of pensions of the Navy on the rolls November 1, 1873, and the amount which was paid during the last fiscal year.

	On the rolls November 1, 1873.	Yearly amount of pensions on the rolls November 1, 1873.	Amount paid for pensions during fiscal year ending June 30, 1873.
Navy invalids	1,484	$155,310 75	$160,971 98
Navy widows and others	1,799	290,516 00	302,936 71
Total	3,283	445,826 75	463,908 69

ESTIMATES AND EXPENDITURES.

The appropriations made by Congress for the fiscal year which ended June 30, 1873, including the amount of the special appropriation made last winter, and expended before the date named, were in the whole $20,589,601.57, and the actual expenditures for that period, viz, from July, 1872, to June 30, 1873, chargeable to these appropriations, including the expenditure during the time named of the special appropriations above referred to, amounted to $19,552,272.16, or something more than a million less than the whole amount appropriated. The appropriations made for the current year commencing July 1, 1873, amount in the aggregate, including the special appropriation for the new sloops of war, (less the small amount expended before June 30, 1873,) to the sum of $23,147,857.68. The amount of these appropriations for the current year drawn, up to the first of the present month, is $10,008,182.63, which, reduced by the amount remaining in the hands of the paymasters and agents of the Government, will leave about $6,500,000 as the amount actually expended from the current appropriations during the working months of this year.

A detailed account of the monthly expenditure of the Navy appropriations for the fiscal year 1872–'73, and for the present year (1873–'74) to November 1, will be found in the Appendix.

ESTIMATES.

Pay of officers and seamen of the Navy	$6,500,600 00
Pay of civil establishment in navy-yards	343,215 50
Ordnance and Torpedo Corps	651,344 71
Coal, hemp, and equipments	1,500,000 00
Navigation, navigation supplies	122,500 00
Hydrographic work	59,800 00
Naval Observatory, Nautical Almanac, &c	59,050 00
Repairs and preservation of vessels, &c	3,505,000 00
Steam-machinery, tools, &c	2,200,000 00
Provisions	1,587,600 00
Repairs of hospitals and laboratories	50,200 00
Surgeons' necessaries	40,000 00
Contingent expenses of various departments and bureaus	468,600 00
Naval Academy	129,707 40
Support of Marine Corps	1,105,911 25
Naval Asylum, Philadelphia, &c	69,307 00
Maintenance of yards and docks	860,000 00
	19,252,235 86

And to these is added the sum of $864,589.28 for current repairs of buildings, docks, and incidental expenses in navy-yards, &c.

These estimates are less than those of last year by rather more than $2,000,000, but they do not include any extraordinary expenditure for the permanent improvement of the Navy, nor the amounts necessary either for the repair of our iron-clad fleet, nor for the continued prose-

cution of some of the great works necessary to the proper condition of our naval establishment.

The foregoing is a general report of the condition, situation, and movements of the United States Navy for the past year, and until the commencement of the present month. Since that time, however, events have taken place which make it proper that the Navy should be put at once upon a footing for active service. It is by no means the province of this Department, as such, to take part in the conduct or discussion of any diplomatic question, nor should its attitude, at a time when serious international difficulties are possible, be held to indicate anything more than a determination on the part of a military department of the Government to be prepared for action, should the necessity for action arise. This is the present condition of public affairs, and such is the attitude of the Navy Department.

I have felt it to be my duty, under existing circumstances, to take promptly every means in my power to put our available force in the best possible condition for immediate and active service. All the power and means of the Department are now devoted to this end, greatly aided at every point by the enthusiastic activity of officers of every grade of the service.

Difficult of accomplishment as our purpose at first seemed, difficulties and even apparent impossibilities, are found to fade away before determination and organized activity, and the Navy is already in such a condition, that those to whom our interests and honor are now intrusted, may be relieved from he embarrassments of a situation, where just determination might be disregarded, because thought to be powerless, or decent consideration be mistaken for fear.

It is neither necessary nor proper that I should enter here into the details of our preparations; suffice it to say, that a respectable force of war-vessels and monitors is already on the sea, and concentrating at the station nearest the scene of our possible difficulties; that our whole available iron-clad fleet is in hand, and every wooden war-vessel that will float, in active preparation at the various naval stations. These will be ready for sea, fully fitted, as fast as proper crews can be provided for them; and if the necessity for action should come, before the time for it arrives, all that there is of the American Navy, which can be put afloat on the Atlantic Ocean, will be in condition and position to take its proper part.

Inadequate as this force may reasonably be deemed to the responsibilities and pretensions of a government like ours, and greatly at disadvantage as we certainly will be, in respect of number and character of vessels in a contest, with the fleets of any respectable naval power, I believe that the activity, skill, science, and experience of our Navy

will be found equal to any difficulty which courage dares to meet or energy will avail to conquer. They are thoroughly imbued with the spirit, educated in the details, and experienced in the warlike duties of their profession, skilled in the use of all the terrible weapons which science has provided for modern warfare, and of a mood to meet any crisis without shrinking from danger. Thus prepared and in this spirit, they are ready to meet any of their country's adversaries with the means with which their country provides them.

In taking the action above referred to, the Navy Department has already incurred considerable expense, and has been forced to assume some responsibilities unusual in time of peace, but, convinced of the wisdom of prompt and decided action, I have not shrunk from these responsibilities, nor hesitated, with your approval, to make warlike preparations, in the interests of peace and of humanity. I confidently rely for support in this attitude upon the patriotism and good sense of the American people and their representatives, who cannot fail to remember that our naval condition is the result of causes which have been constantly pressed upon their consideration, but which have failed to receive full attention, doubtless on account of more pressing present requirements and obligations; and who will also clearly realize that duties constantly postponed are certain to be more difficult and much more expensive, when performed in haste, under the pressure of imperious necessity.

The Department has had no necessity to overstep its appropriations, even if it were lawful to do so, but the pressing demands of the present will consume now, what was provided for the service of the year, in several of the working Bureaus. These must be promptly relieved if their work is to go on.

The occasion has shown clearly, I think, that our Navy, as it exists, should at least be put in a condition for active service, and in any event a moderate appropriation for this purpose ought at once to be made. And if war should by any possibility come, we must be liberally provided to utilize the means we have and to provide others to meet the emergency.

GEO. M. ROBESON,
Secretary of the Navy.

The PRESIDENT.

SUPPLEMENT.

MOVEMENTS OF VESSELS IN COMMISSION.

EUROPEAN STATION.

The vessels on the European station are: Wabash, (flag ship,) 45 guns; Congress, 16 guns; Alaska, 12 guns; Shenandoah, 11 guns; Wachusett, 6 guns.

The Brooklyn and Plymouth have returned from the station during the year. The former was put out of commission at Boston July 18, and the latter at Portsmouth June 28.

All the vessels above named, except the Alaska, left Cadiz October 30, 1872, and separated the same evening. Their movements, respectively, have been as follows:

The Wabash, then bearing the flag of Rear-Admiral James Alden, arrived at Gibraltar November 1, left on the 5th; arrived at Tangier the same day, left on the 9th, and arrived at Cartagena on the 13th. She sailed from the latter port on the 23d, and, in company with the Wachusett, reached Villefranche on the 26th. She sailed from Villefranche January 15, 1873, and the next day, with the Brooklyn and Wachusett in company, arrived at Spezia. Thence she proceeded, about January 25, to Naples and to Malta, arriving at the latter place March 3. About the 12th of March she sailed with the Wachusett for the Levant and the Archipelago. Having visited Alexandria, she left that port April 2, and on the 5th arrived at Piræus. She proceeded thence to Syra, sailing April 19 and arriving same day; left there on the 23d, arrived at Leghorn May 1; sailed on the 22d, and reached Villefranche the following day. June 2, Rear-Admiral Alden was relieved by Rear-Admiral A. Ludlow Case.

Bearing the flag of Rear-Admiral Case, the Wabash sailed from Villefranche June 12, for Trieste, and after touching at Genoa, Palermo, Messina, and Syracuse, arrived July 6. From Trieste she sailed July 21, and on the 24th arrived at Corfu. August 5 she left Corfu for the Spanish coast, touched at Messina from the 7th to the 8th, and reached Cartagena on the 14th. She remained on the coast of Spain until October 27, giving attention to our interests at Cartagena, Barcelona, &c., and then proceeded to Villefranche for provisions, &c., arriving on the 31st.

The Congress arrived at Gibraltar October 31, 1872, from Cadiz, left November 5; arrived at Malta on the 15th, left on the 21st; arrived at the Dardanelles on the 25th, left there the 30th, and arrived at Jaffa on the 8th of December. She sailed from Jaffa December 13, touched at Beirut, Port Said, Alexandria, and Messina, and arrived at Naples January 16, 1873. She left Naples February 16, and the next day arrived at Spezia. From Spezia she proceeded, March 7, to Villefranche; arrived the following day. Sailed again the 16th, touched at Marseilles and Malaga, and reached Gibraltar on the 24th. April 22 she took the store-ship Guard in tow, and left for Trieste, at which latter port she arrived May 3, having touched on the way at Brindisi. She left Trieste

May 10, touched at Messina on the 13th, and on the 17th reached Villefranche. June 6 she sailed from Villefranche for the north of Europe, to visit some of the ports of Ireland, England, Germany, Holland, and France. She returned to the Spanish coast in October, and has been cruising in that quarter since.

The Brooklyn arrived at Cartagena November 3, 1872, from Cadiz, left on the 4th; arrived at Palermo on the 18th, left on the 20th; arrived at Messina on the 22d, left on the 24th, and arrived at Naples the next day. She left Naples on the 10th of December, visited Spezia, and arrived at Villefranche on the 27th. * * * January 22, 1873, she sailed from Spezia; arrived at Naples on the 24th, left on the 19th of February; arrived at Villefranche on the 21st, left on the 28th for Barcelona; arrived March 2, left on the 21st; arrived at Gibraltar on the 24th, and on the 31st sailed from the last-mentioned port with the Supply in tow, for Trieste, arriving there April 10. She left Trieste April 24, touched at Naples, and arrived at Villefranche May 7th. On the 2d of June she left Villefranche, bearing the flag of Rear-Admiral Alden, for the United States, touched at Gibraltar and Bermuda, and arrived at New York July 10, whence she was sent to Boston and put out of commission July 18.

The Shenandoah arrived at Tangier October 31, 1872, from Cadiz, left on the 4th November; arrived at Gibraltar the same day, left on the 10th; arrived at Algiers on the 15th, left on the 19th; arrived at Tunis on the 22d, left on the 27th; arrived at Malta on the 29th, and left there December 2 for Milo and Athens, reaching the latter port on the 10th. She sailed on the 26th for Syra and Smyrna. January 8, 1873, she left Smyrna, touched at Syracuse, Port École, Civita Vecchia, and Leghorn, and arrived at Spezia on the 29th. March 3 she sailed for Villefranche, arrived the next day; left the 7th; arrived at Barcelona on the 9th, left May 6; touched at Port Mahon, from 7th to the 17th, and reached Villefranche on the 19th. June 7 she sailed from Villefranche to visit Barcelona and other ports on the coast of Spain. She remained on the coast until November 5, looking after American interests at Malaga, Barcelona, Tarragona, Cartagena, &c., and then proceeded to Nice to prepare for a cruise to Egypt and Syria.

The Wachusett left Cadiz October 30, 1872, in company with the flag-ship, and continued with her till she reached Villefranche November 26, having touched at Gibraltar, Tangier, and Cartagena. She left Villefranche December 8, visited Marseilles and Barcelona, and returned January 1, 1873. She again sailed, in company with the flag-ship, January 15, visited Spezia, Naples, Malta, Alexandria, Port Said, (took the admiral to Jaffa, and returned to Alexandria,) Piræus, Malta the second time, Palermo, Barcelona, and returned to Villefranche May 17. June 7 she sailed from Villefranche, visited Majorca, Marseilles, Ajaccio, Messina, Corfu, and Brindisi, joined the flag-ship at Trieste, and accompanied her to Corfu. From Corfu she was sent to the coast of Spain, and has been in that quarter ever since, visiting Santander, Ferrol, Coruña, Cartagena, Cadiz, and other ports.

The Plymouth arrived at Malaga November 1, 1872, from Cadiz, left on the 3d; arrived at Barcelona on the 9th, left on the 16th; arrived at Toulon on the 18th, left on the 26th, and arrived at Villefranche on the 28th. She sailed from the last-named port December 16, touched at Genoa, and arrived at Spezia on the 21st. From Spezia she proceeded, January 22, 1873, to Lisbon via Villefranche and Gibraltar, and arrived there February 10. She left Lisbon on the 17th of February for the United States via the coast of Africa and the West Indies.

The following places were visited by her: Canary Islands in February; ports Porto Praya and Porte Grande, Monrovia, and Cape Palmas, in March; Elmina, Cape Coast Castle, Fernando Po, Gaboon River, and St. Paul de Loando in April. She left St. Paul de Loando April 28, was at Bridgetown, Barbadoes, 1st to 6th June, and arrived at New York June 18; whence she proceeded to Portsmouth, N. H., and was put out of commission June 28.

The Alaska was put in commission at New York, August 6, 1873, from which port she sailed August 28, touched at Newport, and arrived at Cadiz September 25, since which time she has been stationed on the Spanish coast.

THE NORTH ATLANTIC STATION.

Rear-Admiral Gustavus H. Scott relieved Rear-Admiral Joseph F. Green of the command of this station at Hampton Roads May 15, and is now in command.

The following vessels are now or have been attached to the station at some time during the past year: Worcester, (flag-ship,) 15 guns; Canandaigua, 10 guns; Powhatan, 17 guns; Richmond, 14 guns; Pawnee, 2 guns; Wyoming, 6 guns; Shawmut, 3 guns; Nipsic, 3 guns; Terror, 4 guns; Saugus, 2 guns.

The movements of the vessels above named have been as follows:

The Worcester, bearing the flag of Rear-Admiral Green, having visited St. Thomas, St. John's, Porto Rico, Samana Bay, and Havana, arrived at Key West November 29, 1872. She remained there until February 3, 1873, and sailed for Matanzas, arriving the following day. She left Matanzas February 11, and arrived at Havana the same day. Left Havana the 26th, and arrived at Key West February 27. March 17 she sailed again on a cruise to the southward, arrived at Bridgetown the 2d and left the 5th of April; arrived at St. Pierre, Martinique, April 7, and left the next day for Puerto Cabello; arrived on the 12th, and sailed the same day for Santiago de Cuba; arrived at Santiago de Cuba April 18, and remained until the 22d; arrived at Kingston 24th, left on the 25th, and arrived at Key West May 5.

May 15 Rear-Admiral Scott relieved Rear-Admiral Green, and the latter proceeded in the Powhatan to Boston, where he hauled down his flag May 28.

The Worcester remained at Key West until July 5, when she came to Norfolk for repairs. August 25 she left the navy-yard for Bermuda; arrived there on the 21st. She sailed from Bermuda September 4, arrived at Hampton Roads on the 10th, off the anchorage on the 13th; went to the yard on the 20th, repaired, and sailed again from Hampton Roads for Key West November 18, and arrived there the 23d.

The Canandaigua sailed from Key West December 12, 1872, on a cruise to the southward; arrived at Samana December 24, left on the 26th; arrived at St. Thomas on the 28th, and left January 5, 1873. She was at Pointe à Pitre from the 9th to the 14th of January; at La Guayra from the 17th to the 20th; at Porto Cabello the 21st and 22d; at Curaçoa from the 24th to the 30th; at Santa Martha from the 1st to the 4th of February. February 10 she left Carthagena and arrived at Aspinwall on the 12th; left on the 14th, and reached Havana the 26th. She remained at Havana until March 4, and the following day reached Key West. March 25 she proceeded to Matanzas; remained there until the 31st, and the same day arrived at Havana. She left Havana April 5, touched at Matanzas, remaining there until the 10th,

and arrived at Key West on the 11th. May 10 she left for Vera Cruz, via New Orleans, or the Southwest Pass, to convey the United States minister to his destination. The minister was disembarked at Vera Cruz on the 25th of May, and on the 31st the Canandaigua sailed for Key West, and arrived there June 9. On the 19th of June she sailed for Aspinwall and arrived the 29th. She remained there until August 3, when she proceeded to Kingston, Jamacia, for the benefit of the health of the crew, arriving on the 9th. She left Jamaica September 11, touched at Key West, and reached Hampton Roads, September 25, and was sent thence to Philadelphia for repairs.

The Wyoming sailed from Key West December 14, 1872, landed the United States consul-general to Cuba at Havana, and proceeded thence on a cruise to the southward. She reached San Juan January 2, 1873, and left on the 9th for San Barbara de Samana; thence she proceeded to Santo Domingo City, and Jacmel and Aux Cayes, and arrived at Kingston on the 19th. From Kingston she went to Port au Prince, also to Gonaives, Nicola Mole, and arrived at Santiago de Cuba February 4th. She le.t there on the 9th, touched at Matanzas, and reached Key West on the 19th. March 15 she proceeded to the Mexican coast, where she remained until June 4, and returned to Key West June 14. From Key West she came to Hampton Roads, arriving July 10, and went up to the yard on the 25th. August 6 she sailed for Aspinwall via Bermuda and Kingston; arrived at Bermuda August 28, sailed September 2; arrived at Kingston September 9, left on the 20th, and arrived at Aspinwall September 25, where she remained until November, when she went to Santiago de Cuba.

. The Nipsic, from November, 1872, to January, 1873, was visiting the ports of Santo Domingo. January 7 she left Samana for Silver Bank Passage to examine shoals in the vicinity. She subsequently visited Cape Haytien, Guatanamo, and Havana, and arrived at Key West February 2. She left Key West February 13, on surveying service, on which she was engaged to 13th March, when she proceeded to San Juan for supplies, &c. April 10 she left for Samana, arrived on the 12th, left on the 14th, searched for Silver-Bank Passage Shoal, Clarion Shoal, Ciudado Reef, visited Matthew Town, and arrived at Nuevitas May 6. She proceeded thence to Key West via Matanzas, and arrived May 16. June 23 she left for Hampton Roads, thence for New York, and was put out of commission July 26.

The Shawmut was under repairs at Key West until March 5, when she sailed for and arrived at Havana the next day. She left Havana for Matanzas, March 26, and arrived the same day. She remained at Matanzas until April 28, when she proceeded to Key West. June 23 she left Key West for Hampton Roads; arrived on the 30th. July 30 she arrived at Washington, and has since been under repairs.

The Saugus left Philadelphia November 28, 1872, arrived at Key West February 13, via Norfolk and Savannah, and has since been at anchor in that harbor.

The Terror, having been relieved by the Saugus, left Key West May 17 in tow of the Powhatan, arrived off the Delaware River May 24, and came up to Philadelphia, where she was put out of commission June 10.

The Pawnee arrived at Key West February 8, 1873, from Pensacola, and has been stationed there since that time.

The Richmond was commissioned at Philadelphia November 18, 1872; sailed, December 15, for Norfolk, arrived there the 19th; left Hampton Roads January 31, 1873; reported for duty on the station at Key West February 11, where she remained until the 23d, and proceeded to survey

a supposed shoal near Jupiter Inlet. She returned to Key West March 9, left the 13th, arrived at San Juan, Porto Rico, the 22d; left the 28th, surveyed a shoal in the vicinity of Bolandar Head, and arrived at San Domingo City the 31st. She left San Domingo the same day, proceeded to Kingston, Jamaica, arrived there April 3, left the 5th for Santiago de Cuba, and arrived on the 7th. She remained there until the 12th, and effected the release of certain American seamen who were being tried, then proceeded to Guantanamo Bay; thence to Port au Prince and Cape Haytien. She left the latter place April 15, arrived at Havana on the 19th, left on the 21st, and arrived at Matanzas same day. She left Matanzas on the 29th, and arrived at Key West on the 30th. May 10, having been detached from the station, she left Key West for the North Pacific station, arrived at Rio de Janeiro July 7, sailed on the 26th, and reached Valparaiso October 4. She left the latter port October 25 for San Francisco.

The Powhatan, with the Saugus, left Philadelphia November 28, 1872, and arrived at Key West, via Norfolk and Tybee Roads, February 13, 1873. During the month of April she was employed a few days in assisting the telegraph company. May 6, she went over to Havana, returned on the 8th, and on the 17th left for Boston, via the capes of the Delaware, with the Terror in tow; arrived off the capes May 24, and at Boston May 28. July 25 she left Boston for Hampton Roads, and arrived on the 29th. In August she proceeded to Halifax, and returned to New York in September. In November she was ordered to Philadelphia, which port she left the 25th of that month with the Manhattan for Key West, but returned and took a second departure December 5, the last time from Wilmington.

THE SOUTH ATLANTIC STATION.

The vessels on this station are: Lancaster, (flag-ship,) 22 guns; Ticonderoga, 11 guns; Wasp, 1 gun.

The Ticonderoga is about sailing for the United States. Rear-Admiral William Rogers Taylor was relieved by Rear-Admiral James H. Strong, at Rio de Janeiro, October 31.

The movements of the vessels have been as follows:

The Lancaster having completed repairs about the middle of November, 1872, left Rio de Janeiro on the 25th of that month for the La Plata. January 18, 1873, Rear-Admiral Taylor transferred his flag temporarily to the Wasp and made a visit to Buenos Ayres, Rosario, and Colonia, and returned to Montevideo February 9. The Lancaster in the mean time made a cruise to the south, returning about the 9th of February. She remained in the vicinity of the La Plata until the latter part of May, visiting Moldanado, Montevideo, St. Catharines, and Santos, and arrived at Rio de Janeiro June 11. She remained at Rio under repairs until August 28, when she proceeded on a cruise northward, arriving at Bahia September 16, leaving there the 29th and returning to Rio de Janeiro October 7. October 31, Rear-Admiral Taylor was relieved, as above stated.

The Ticonderoga sailed from Montevideo December 30, 1872, for Rio de Janeiro, where she arrived January 22, 1873. She left Rio January 28, for Santos and St. Catharines, and arrived at Montevideo from the last-named port March 14. She remained in the vicinity of the La Plata until about the middle of April, when she proceeded to Rio de Janeiro, arriving May 28. June 30 she proceeded southward again—visited Montevideo, Buenos Ayres, St. Catharine's, Santos, and returned

to Rio de Janeiro October 20, from which port she expected to sail for the United States.

The Wasp, in November, 1872, visited Moldanado and Rio Grande de Sul, and was used by Rear-Admiral Taylor temporarily to visit, in January, Rosario, Buenos Ayres, and Colonia, from which service she returned to Montevideo February 9. In April she went to Colonia and returned to Montevideo May 3. She remained there, having new tubes put in her boilers, until fall. When last heard from, October 6, she was at Asuncion, having conveyed the United States minister up the Paraguay.

THE NORTH PACIFIC STATION.

The vessels on the North Pacific station are: Saranac, (flag-ship,) 11 guns; Benicia, 12 guns; Richmond, 14 guns.

The California was put out of commission at San Francisco July 3, and the St. Mary's, which returned from the station, at Norfolk, June 17.

The movements of the several vessels have been as follows:

The California, bearing the flag of Rear-Admiral Pennock, arrived at Honolulu January 15, from San Francisco, where, on account of affairs at the Sandwich Islands, she remained until May 7, then returned to San Francisco, arriving May 25. Rear-Admiral Pennock having transferred his flag to the Saranac, hoisting it June 28, the California was put out of commission as above stated.

The Richmond arrived at San Francisco December 4, from the North Atlantic station, and reported for duty on this station.

The Saranac arrived at San Francisco November 23, 1872, from Panama and intermediate ports. She sailed again in January, 1873, for the Mexican and Central American coasts. In February she visited Mazatlan, San Blas, and Acapulco, and in March, Punta Arenas, Corinto, and La Union, and returned to Acapulco March 16. April 25 she arrived at San Francisco, and June 28, Rear-Admiral Pennock transferred his flag to her. She left San Francisco July 5, on a northern cruise, and arrived at Esquimault on the 12th, left there on the 16th for Sitka, via the inland passage, anchored at numerous places on the way, and reached Chilcat Village, head of navigation, on the 30th. Leaving Sitka August 19, she returned the same route, visited Port Townsend, Seattle, Steilacoom, Olympia, and reached San Francisco September 29. October 7 she sailed for Honolulu and arrived on the 19th.

The Benicia arrived at Honolulu January 4, 1873, from San Francisco, and remained at the Sandwich Islands until the latter part of March. While there the flag was temporarily transferred to her. April 7 she arrived at San Francisco, filled up with stores, made some repairs, and sailed May 5 for Panama. She touched at some of the Mexican and Central American ports, and arrived at Panama August 12. In the latter part of September and early part of October she co-operated with the flag ship of the South Pacific station, by landing a force at Panama for the protection of American citizens and property.

The St. Mary's sailed from San Francisco, November 23, 1872, for the Atlantic States. She arrived at Valparaiso January 23, 1873, left there February 20, arrived at Barbadoes April 28, touched at St. Thomas, and arrived at Norfolk June 3, where she was put out of commission as above stated.

The Narragansett arrived at Callao January 1, sixty-five days from Sydney, Australia. She made certain repairs and alterations at Callao,

sailed March 20, and arrived at Panama April 2. From Panama she proceeded to Lower California, and has been engaged in surveys in that vicinity.

THE SOUTH PACIFIC STATION.

The vessels now on this station are, the Pensacola, (flag-ship,) 22 guns; Omaha, 12 guns; Onward, 3 guns.

The Tuscarora was early in the year on the station, but was withdrawn for special service.

The movements of the vessels have been as follows:

The Pensacola, flag-ship of Rear-Admiral Charles Steedman, arrived at Talcahuano December 4, 1872, from Payta; left there on the 12th, and arrived at Valparaiso on the 14th of December. She remained at the last-mentioned port until March 20, when she proceeded to Coquimbo, arriving on the 22d. She left Coquimbo April 1, and arrived at Callao on the 9th; left Callao on the 22d for Panama, touching on the way at Payta, and arrived May 8. At Panama she landed a force for the protection of American citizens and their property during the revolution. She sailed from Panama June 2, arrived at Payta on the 10th and at Callao on the 18th, where she remained until the 9th of July, and then proceeded to Coquimbo. In September she left for Panama, where on the 22d of that month Rear-Admiral Steedman was relieved by Rear-Admiral John J. Almy. Shortly after the latter took command of the station, a second landing of men was made from the Pensacola for the same purpose as in the first instance. The Pensacola remained at Panama until October 23, when she proceeded south, bound for the coast of Chili.

The Omaha, which sailed from Philadelphia October 8, 1872, to join the station, arrived at Valparaiso February 6, 1873. March 20 she left Valparaiso in company with the flag-ship, and arrived at Coquimbo on the 22d. She remained at Coquimbo until April 7, when she proceeded to Callao, via Iquiqui, and arrived on the 21st. June 2 she left Callao for Panama, and arrived on the 15th. On the 25th of June she sailed for Guayaquil, thence to Coquimbo and Valparaiso. She was at Callao August 30.

The Tuscarora left Valparaiso October 30, 1872, for Callao, and on the 24th December sailed from the latter port for Panama, to co-operate with the Darien surveying expedition. She arrived at Panama January 1, 1873, and was engaged in this service until May 17, when she sailed for San Francisco, via Acapulco. She was at Acapulco from May 26 to June 1, and arrived at San Francisco June 25. She was subsequently engaged in surveying on the northwest coast, to determine a suitable route for a submarine cable, and returned to San Francisco from this service November 6.

The Onward has been permanently stationed at Callao.

ASIATIC STATION.

The following vessels comprise the force now on the Asiatic station: Hartford, (flag-ship,) 18 guns; Iroquois, 6 guns; Lackawanna, 10 guns; Saco, 3 guns; Palos, 6 guns; Monocacy, 6 guns; Ashuelot, 6 guns; Yantic, 3 guns; Idaho, 7 guns.

The movements of the vessels on this station during the past year have been as follows:

The Colorado left Hong-Kong November 21, 1872, arriving at Singapore on the 28th, and on the 2d of December sailed for the United States, touching at Anjer and Cape Town, and arrived March 12, and was put out of commission March 25, 1873.

The Hartford arrived at Point de Galle, Ceylon, via Suez Canal, on February 20; from thence to Penang, and, leaving March 3, arrived at Singapore on the 6th; from thence to Manila, arriving March 22; thence to Hong-Kong, arriving 30th March. On the 3d of April, Rear-Admiral Jenkins changed his flag to the Hartford from the Lackawanna. The Hartford left Hong-Kong for Amoy 30th April, arriving May 2; leaving the same day, arrived at Shanghai on the 10th; remained at Shanghai until July 12, when she left for Wusung; and in a few days sailed for Nagasaki, arriving on July 21; remained in Nagasaki until October 4, then sailed for Woosung, arriving on the 6th. On the 12th October entered the Yang-tse River, arriving at Chin-Kiang on the 14th; will reach Kiu-Kiang to-morrow, and will proceed to Hankow; from Hankow she will return to Shanghai, and thence to Hong-Kong, to arrive there about the 1st of December.

The Lackawanna left Hong-Kong, in company with the Colorado, November 21, 1872, arriving at Singapore on the 29th; sailed from Singapore December 6, calling at Pulo Penang, and remained four days; sailed thence to Calcutta, arriving December 20; sailed from Calcutta January 3, 1873, touching at Penang, and arrived at Singapore January 15; thence to Bangkok, arriving January 29. On February 8 sailed for Saigon, arriving on the 13th; thence on the 18th for Manila, arriving on February 26; sailed from Manila March 1, arriving at Hong-Kong 4th March, remaining until the 20th; in company with the Monocacy visited Macao and Whampoa, the Monocacy carrying my flag to Canton; returned to Hong-Kong on April 2, and sailed for Yokohama on the 10th, arriving on the 20th; remaining a short time in Yokohama, sailed for Nagasaki, visiting Kobe *en route*, and arriving at Nagasaki June 1; on June 12, in company with Yantic and Saco, sailed for Shanghai, arriving on the 15th; on the 18th of July sailed from Shanghai for Che-foo, arriving on the 22d, remaining two days; made short visits to Teng-chu-fu, Taku, and Ninghai; thence to Nagasaki, arriving August 2; sailed from Nagasaki to Wadwostok, Russian Siberia, arriving 28th, and left 31st August; thence to Hakodadi, arriving September 3; arrived, probably, at Yokohama about October 15, and is at this date on her way to or at Nagasaki.

The Iroquois, having been under repairs at Shanghai, left March 12, for Nagasaki, arriving on the 15th; thence on the 21st March to Kobe; thence on the 2d April to Yokohama, arriving on the 4th. Left Yokohama April 29, arriving at Shanghai May 4. Remained in Shanghai until July 22, when she sailed for Nieu-chwang; remaining there from July 28 until August 9th; thence to Nenghai, 10th August; Taku Bar, 11th to 13th August; Teng-chu-fu, 15th to 17th August; arriving at Che-foo August 18. On September 9 sailed for Shanghai, arriving on the 11th and leaving on the 17th; arrived at Chin-Kiang, Yang-tse River, on the 19th, and on the 15th October left for Shanghai.

The Saco, having been under repairs at Shanghai, sailed from thence on the 1st March for Nagasaki, arriving on the 5th; left on the 8th for Kobe, arriving on the 11th; left on the 17th for Yokohama, arriving 19th of March. Again left Yokohama May 1; in Kobe from 6th to 8th, arriving in Nagasaki on the 10th. In company with Lackawanna and Yantic sailed June 12 for Shanghai, arriving on the 15th. Left Shanghai June 30th, arriving at Taku Bar July 4, and proceeded to Tien-tsin; remained there until August 22; in Che-foo from 24th to 27th August, arriving at Nagasaki 31st August. Left Nagasaki September 8, visiting Kobe *en route*, and arrived at Yokohama 15th September, where she still remains.

The Yantic sailed from Zanzibar January 23, arriving at Seychelles

on February 1, and leaving on the 14th; Point de Galle, from 5th to 9th of March; Pulo Penang, 22d and 23d of March; Singapore, 25th March to 2d of April, reaching Hong-Kong 15th of April. Left Hong-Kong May 18, calling at Amoy, 21st to 25th of May; Foo-chow, 26th to 29th May, reaching Nagasaki 5th of June. On the 12th of June, in company with Lackawanna and Saco, sailed for Shanghai. Left Shanghai June 30, calling at Nagasaki from 3d to 6th of July, Kobe 8th to 9th, arriving at Yokohama on the 11th. Sailed from Yokohama September 16, Kobe 19th to 20th September, reaching Nagasaki on the 22d. Sailed for Shanghai October 4, arrived on the 6th. She is under orders to go to Hong-Kong, and thence proceed to visit Manila and the ports in the Philippine Islands to the southward of Manila, Ilo-Ilo, Zebu, &c., and the Sulu Sea; to visit Brunai, capital of Borneo, Batavia, Singapore, Acheen, Penang, and Malacca.

The Ashuelot left Tien-tsin on July 3, arriving at Nagasaki on the 10th. Sailed from Nagasaki August 5, calling at Kobe on the 8th, arriving at Yokohama on the 14th, and remains at Yokoska, Japanese government dock-yard, under repairs.

The Monocacy left Shanghai for the ports on the Yang-tse River on November 13; in Chin-Kiang from 14th to 16th; in Kin-Kiang, 18th to 20th, reaching Hankow on the 21st. Remaining until the 28th of December, started down the river; Kin-Kiang 29th to 30th, 1872; Chin-Kiang from 1st to 15th of January, 1873, arriving at Shanghai on the 17th. Left Shanghai February 8, calling at Foo-chow, 11th to 15th February; Amoy, 16th to 19th; Swatow, 20th to 24th, reaching Hong-Kong February 25. Left, in company with Lackawanna, for Macao March 20 to 24, thence to Canton, the Lackawanna remaining at Whampoa. Left Canton April 1, arriving at Hong-Kong on the 2d. Sailed from Hong-Kong April 27; calling at Swatow 28th to 29th; Amoy, 30th April to 3d of May; Foo-chow, from 5th to 11th of May; Ningpo, from 13th to 16th, reaching Shanghai on the 17th. Sailed from Shanghai on July 16; Nagasaki, July 20. Left Nagasaki 24th, Kobe, 26th, arriving at Yokohama July 28, and went to Yokoska, where she is under repairs, which will be completed about November 1.

The Palos sailed from Ningpo January 22, reaching Shanghai on the 23d, leaving on the 26th to visit the ports on the Yang-tse River. On account of low water did not reach Hankow until April 4; remained until May 12, and, visiting the treaty-ports on her way down, reached Shanghai May 12. Leaving Woosung July 18, arrived at Nagasaki on the 22d. Sailed August 6, calling at Kobe 8th and 9th, arriving at Yokohama on the 11th, and went to Yokoska on the 12th, where she is under repairs at Japanese government dock-yard. She is expected to be ready for service by the 1st of November, and will be sent to Tien-tsin, on the Peiho River, for the winter.

The Idaho was towed by the Yantic on the 25th of July from Yokohama to Yokoska, and is stationed at the latter place.

The Alaska arrived at New York from this station February 14, and was put out of commission February 26.

MISCELLANEOUS.

The Supply was put in commission at New York February 8, 1873, to carry out American contributions to the Vienna Exposition. She sailed March 5, and arrived at Trieste April 10, having been towed from Gibraltar by the Congress. She arrived at New York November 22, (on return from this service,) and was put out of commission December 3.

The Guard was commissioned at New York February 1, 1873, for the

same service as the Supply, and sailed March 22. She reached Trieste May 3, having been towed by the Congress from Gibraltar. She has not returned.

The Kansas, on special service connected with the Nicaragua survey, left Hampton Roads December 3, 1872, and arrived off Greytown December 20. She returned to New York from this service July 23, 1873. While on the Central American coast she was frequently at Aspinwall, protecting American interests in that quarter. November 14 she sailed from New York for Santiago de Cuba.

The Portsmouth, specially fitted out for surveying service in the Pacific, sailed from New York late in December, 1872, and arrived at Talcahuano, Chili, March 20, 1873. She proceeded thence to Valparaiso and Honolulu, arriving at the latter port May 23. She has been engaged in surveying and in examining reported dangers in the Pacific, making Honolulu her headquarters. She was at that port October 7, and expected to sail, October 9, on a surveying cruise.

The Constellation, with the cadet-midshipmen on board, left Annapolis, June 9, on a practice-cruise; passed the capes of the Chesapeake June 20, and came to anchor off Newport, R. I., July 20. She passed the remainder of the summer in that vicinity and in the adjacent waters of Long Island Sound and Gardiner's Bay, and, September 6, sailed for the Chesapeake. She reached the inside of the capes September 9, and on the 29th of that month returned to the Academy.

The Fortune was commissioned at the Washington navy-yard June 20, and on the 24th proceeded to Annapolis, where the cadet-engineers were received on board, and left again July 5. She visited Wilmington, Del., Chester, Philadelphia, New York, Cold Spring, West Point, and Boston, and returned to Annapolis, via Washington, September 27.

The Juniata was put in commission at Boston, February 10, 1873; went around to Newport, and thence to New York, arriving at the latter place May 7. She was assigned to special service in connection with the search for the Polaris, and her movements are detailed in the Secretary's report. November 19 she sailed from New York for Cuba.

The Ossipee was commissioned at New York October 10, 1873; left there, November 14, for Newport, thence for Hampton Roads, arriving on the 20th. With the Mahopac in tow, bound to Key West, she passed the capes November 25.

The Mahopac was commissioned at Norfolk, November 21, 1873, and left Hampton Roads on the 20th for Key West.

The Manhattan was commissioned at Philadelphia, November 19, 1873, and in company with the Powhatan started for Key West on the 25th. She returned to Wilmington, after passing the capes of the Delaware, December 1, and sailed again December 5.

The Monongahela was put in commission at Portsmouth, N. H., September 22, 1873; left there, October 2, for Newport, and sailed from the latter place for the Pacific November 12.

The Gettysburg was commissioned at Washington November 6, 1873, taking the place of the Tallapoosa.

The Pinta was commissioned at Philadelphia November 22, 1873, and sailed on the 25th for Key West.

The Mayflower sailed from Portsmouth, N. H., November 22, for Boston, New York, Norfolk, and Key West.

The Bluelight, engaged on special service under the United States commissioner on fish and fisheries, left Washington June 28 for the coast of Maine. She returned to Portsmouth, N. H., September 6, and was put out of commission September 13.

APPENDIX.

No. 1.

ESTIMATES SECRETARY'S OFFICE, &c.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1875, by the Navy Department.

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
SECRETARY'S OFFICE.		
SALARIES.		
For salary of Secretary, per act of March 3, 1853, (10 Stat. at L., p. 212, sec. 4)	$10,000 00	.....
For salary of chief clerk, per acts of July 5, 1862, (12 Stat. at L., p. 510, sec. 3,) and July 16, 1870, (16 Stat. at L., p. 249, sec. 1)	2,500 00	.....
For salary of disbursing clerk, per acts of July 5, 1862, (12 Stat. at L., p. 510, sec. 3,) and July 12, 1870, (16 Stat. at L., p. 249, sec. 1)	2,000 00	.....
For salary of four clerks of class four, per acts of March 2, 1865, (13 Stat. at L., p. 454, sec. 1,) and March 3, 1871, (16 Stat. at L., p. 492, sec. 1)	7,200 00	.....
For salary of four clerks of class three, per acts of July 5, 1862, (12 Stat. at L., p. 516, sec. 3,) and March 3, 1871	6,400 00	.....
For salary of two clerks of class two, per acts of July 5, 1862, (12 Stat. at L., p. 511, sec. 3,) and March 3, 1871	2,800 00	.....
For salary of three clerks of class one, per acts of July 5, 1862, (12 Stat. at L., p. 511, sec. 3,) and March 3, 1871	3,600 00	.....
For salary of two messengers, at $840 each, per act of July 12, 1870, (16 Stat. at L., pp. 240, 250, sec. 192)	1,680 00	.....
For salary of two laborers, at $720 each, per acts of July 12, 1870, and March 3, 1871	1,440 00	.....
	37,620 00	$37,620 00
CONTINGENT EXPENSES.		
For stationery, furniture, newspapers, and miscellaneous items	5,000 00	5,000 00
NAVY DEPARTMENT BUILDING.		
SALARIES.		
For salary of superintendent	250 00	.....
For salary of five watchmen, per acts of July 5, 1862, (12 Stat. at L., p. 511, sec. 3,) March 3, 1869, (15 Stat. at L., p. 297, sec. 1,) and July 12, 1870	3,600 00	.....
For salary of two laborers, per acts of March 2, 1865, (13 Stat. at L., p. 454, sec. 1,) March 3, 1869, (15 Stat. at L., p. 297, sec. 1,) and July 12, 1870	1,440 00	.....
	5,290 00	5,290 00
CONTINGENT EXPENSES.		
For incidental labor, fuel, lights, and miscellaneous items	7,000 00	7,000 00
NAVY.		
CONTINGENT EXPENSES.		
Rent and furniture of buildings and offices not in navy-yards; expenses of courts-martial, courts of inquiry, boards of investigation, examining-boards, with clerks' and witnesses' fees, and traveling expenses and costs; stationery and recording; expenses of purchasing-paymasters' offices at the various cities, including clerks, furniture, fuel, stationery, and incidental expenses; newspapers and advertising; foreign postage; telegraphing, foreign and domestic; copying; mail and express wagons, and livery and express fees and freight; all books for the use of the Navy; experts' fees and costs of suits; commissions, warrants, diplomas, and discharges; relief of vessels in distress, and pilotage; recovery of valuables from shipwrecks; quarantine expenses; care and transportation of the dead; reports, professional investigation, and information from abroad; and all other emergencies and extraordinary expenses arising at home and abroad, but impossible to be anticipated or classified	125,000 00	100,000 00

No. 2.

NAVAL ACADEMY.

REPORT OF THE BOARD OF VISITORS.

UNITED STATES NAVAL ACADEMY,
June 2, 1873.

SIR: The Board of Visitors appointed "to attend the Academy during the May examination, for the purpose of witnessing the examination of the graduating and other classes, and of examining into the state of the police, discipline, and the general management of the institution," have the honor to present the following report:

The board entered upon its duties on the morning of May 20, all the members, with a single exception, being present. After the customary formal reception by the Superintendent and officers of the Naval Academy, the board organized by the choice of Rear-Admiral Charles H. Davis, U. S. N., as president, Bvt. Maj. Gen. Joseph J. Reynolds, U. S. A., as vice-president, and William H. Hackett, esq., as secretary.

For the purpose of observing as carefully as possible the stated examinations, the board appointed a standing committee, whose duty it should be to assign the members from day to day to attendance at the various class-rooms. This arrangement secured the presence of from one to three members at each examination, and, on one day, the board in a body attended successively all the examinations in progress. Standing committees were also charged with the duty of examining the general condition and management of the Academy, as respects the grounds and buildings, the system of police and discipline, the course of study and methods of instruction, and such other matters as might from time to time suggest themselves.

These committees examined in detail and with great care the several matters referred to them, and the results of their investigations were in all cases presented to the meetings of the board, and there fully discussed. The board is able to say, therefore, with entire confidence, that its conclusions are based upon as careful observation and reflection as could be bestowed upon so important subjects within the limited time allowed. The Superintendent and his entire corps of assistants placed within reach of the board every possible facility for the performance of the duties assigned to it, and it may be stated, in general, that the present condition of the Academy is in every important respect exceedingly prosperous and satisfactory.

The board is glad to believe that any prejudices against the Academy, which may have formerly existed, have passed away; or that, if they still exist, it is only in cases where the real facts are imperfectly understood.

All the appointments of the place are in excellent order. The grounds are kept in the most neat and tasteful condition; the arrangements for the various kinds of drill and exercise are admirably adapted to the instruction of the cadets in a knowledge of their duties, as well as to maintain a high standard of physical health; and the course of study land methods of discipline are thorough and successful.

The suggestions and recommendations that have been agreed upon, to be presented in this report, are accordingly made, not so much as criticisms upon the present organization, as indications of some particular directions in which the system already established may be made stil

more successful and efficient. While there have been differences of opinion among the members of the board on some important subjects, the conclusions here presented have been adopted with substantial unanimity, and on one point, at least, there has been a most cordial and emphatic agreement, viz, that the Academy should be supplied with the very best equipment in men and appliances that can be furnished. No economy could be more unwise than that which would withhold from a national institution like this anything that could increase its vigor and efficiency. Whatever the exigencies of the future may require of the military arm of the United States service, it seems inevitable that the Navy should steadily increase in relative importance, both as an arm of defense along our extended coast-lines, and as a means of maintaining our widening intercourse with other parts of the world. It seems the obvious dictate of good judgment, therefore, that the officers who are to be intrusted with the responsible duty of directing this branch of the service should receive the most thorough training, theoretical and practical, that the resources of the country can supply.

In order to present the conclusions of the board as briefly and clearly as possible, they may be grouped under a few distinct headings.

I.—THE GROUNDS AND BUILDINGS.

These, as has been already indicated, are as well kept as could be desired. The chapel, the library, the new mess-hall, and some others of the buildings, are well adapted to the purposes for which they are intended, though it seems desirable, as previous boards have recommended, that the laundry and water-closets should be removed from the basement of the mess-hall, as soon as the purchase of additional ground, for which provision has already been made by a law of Congress, shall be completed. A few additions to the buildings, however, are imperatively needed at once.

1. *A new armory.*—The building now used for this purpose is in every respect unfit. It is so low on the ground that it has been found necessary to overlay a second floor upon the first, in order to keep it approximately dry; but this does not prevent the upper floor from being perceptibly damp for weeks together; moreover, the main walls are so insecure that one of them has to be supported by props, and there is a general appearance of shakiness about the structure, which is only partly concealed by an abundance of paint.

2. The growing wants of the department of steam-enginery require some enlargement of the building occupied by it. This is one of the most important and successful departments of the institution, and the board is unanimously of opinion that its needs should be supplied in the most liberal spirit. It is understood, from plans prepared under the direction of the Navy Department, and submitted to the board, that the necessary room can be secured at a comparatively trifling expense, by making some simple additions to the present building, without essential modification of its plan or appearance.

3. The accommodations for the department of physics and chemistry are altogether insufficient. The instructors in these subjects, and in mechanics, are obliged to use the same lecture-room, which can only be done at great and almost daily inconvenience; and the laboratory for the use of students in analytical chemistry can accommodate only eight at a time. The supply of apparatus, too, is entirely inadequate. The present appropriation for this purpose ($250) ought to be at least quad-

rupled. A better and better-ventilated lecture-room, a larger and better-equipped chemical laboratory, and a physical laboratory fitted up with an ample supply of the most approved apparatus, are absolutely necessary to save this department from being a discredit to the Academy and the Government.

4. The board emphatically concurs in the recommendation which has been made in former years, that some provision be made for a swimming-school. The importance of this seems sufficiently obvious, without a word of argument.

5. The board is also of opinion that the proposed purchase of additional grounds, which has already been referred to, is a measure of importance to the Academy, if it can be consummated on reasonable terms. An undesirable neighborhood will thereby be removed from immediate proximity to the Academy, the water-front will be considerably extended, and room will be secured for marine barracks, in place of the present structures, which are entirely unfit for the purpose, with other buildings that may from time to time be required.

II.—THE COURSE OF STUDY.

The board has been most favorably impressed with the excellence of the methods of instruction here pursued, and the satisfactory results attained. The whole course of study is arranged with a view of securing one practical end, the training of good officers for the Navy. The academic studies are accordingly taught with constant reference to their applications, and the practical exercises are conducted as models of practice in actual service, as well as illustrations of fundamental principles.

No one can examine the matter carefully without a high appreciation of the work that the Academy is doing, both in the way of furnishing the service with a body of accomplished and efficient naval officers, and of developing, with remarkable success, a system of education which combines in due proportion the theoretical and the practical.

An educated man, as the phrase ordinarily goes, may not be a good officer, and a good officer is not necessarily an educated man; but the graduates of the Naval Academy can scarcely fail to be both. In a few particulars the board is of opinion that the course of study, without the introduction of any radical changes, might be considerably improved.

1. It is found, for instance, that a good many cadets drop out of the Academy at the close of the first year, from inability to keep up with their class. During the last ten years about fourteen hundred cadets have entered the Academy, five hundred of whom have left before the middle of the second year. These are boys who are not thoroughly grounded in a knowledge of arithmetic, or have not studied algebra at all before entering the Academy. The rule seems to be that boys who are not well prepared in these two points are unable to go on successfully with the studies laid down for the first year (fourth class) of the course in the Academy. It would be, on every account, undesirable to lessen the amount or lower the standard of work required in that year; and the board therefore strongly recommends that arithmetic, elementary algebra, English grammar, and descriptive geography be added to the requirements for admission. This would but slightly raise the nominal standard; and it would exclude very few, if any, who are likely to maintain a respectable standing in the course as now organized. As the case now is, the requirements for admission, annually announced,

are a standing invitation to boys to enter the Academy whose preparatory training is not such as to make it probable that they can succeed in completing the course. A wrong is thus done to the Government as well as to the individual concerned, and the board proposes only that the full amount of preparation which is really needed shall be distinctly stated.

2. The board also recommends that cadets be appointed a full year in advance, whenever it is possible, as is now done at the West Point Academy. This would enable candidates to make their preparations more thorough, and thus greatly diminish the risk of subsequent failure and mortification.

3. By a law of Congress, enacted at its last session, it is provided that the course of study for the class entering the Academy in 1873, and subsequently, shall be six years instead of four. It has been thought by some that the two additional years should be spent in service at sea; but, after a careful consideration of the subject, this board earnestly recommends that one of the years be spent in additional study at the Academy. The principal reason for this recommendation is, that the cadet-midshipmen are already receiving about three months of sea-practice every year, and therefore do not, in the opinion of those best qualified to judge, need so much additional service before entering the grade of midshipmen; while there are many subjects, either altogether omitted from the present course, or but little studied, in which more instruction is very desirable. The amount of French and Spanish now taught is insufficient. It is important that the knowledge of modern languages, once acquired, should be retained and increased by constant use, either by continuing the instruction through every year of the course, or by pursuing, in text-books written in these languages, some of the subjects taught in the higher classes. Much more time should be devoted also to the study of international law (with a more suitable text-book than Kent's first nine Lectures) and constitutional law. In ethics no instruction whatever has been given for some time past, and in order to remedy this deficiency, as it is understood the Superintendent proposes to do the coming year, some other study of perhaps equal importance must be displaced. The same may be said respecting the law of naval courts-martial, which now is not studied at all, but the importance of which, to the complete education of a naval officer, is obvious. The elements of mental science, logic, and political economy ought also to be studied; and more time is needed for history in general, and military and naval history in particular. It is, however, plainly impossible to introduce these various subjects, or any of them, into a course already overcrowded. The only resource is, either to omit some important subjects that are now pursued, or else to extend the time. The board carefully considered the former alternative, with a particular view to the question whether some portion of the studies in higher mathematics might not, perhaps, be dropped from the course. The result of the examination was, however, a unanimous conviction that more rather than less time could be profitably devoted to these branches, and that no part could be omitted without seriously impairing the success and usefulness of the entire system. The whole scheme of teaching in the department of mechanics is made to depend on the doctrines of the calculus; and the calculus, in turn, is habitually taught, by an original and highly successful method, with direct reference to its practical applications. The board is therefore driven to the conviction that an addition of one year to the present course of study is essential to the

symmetry and completeness of a system which is already producing admirable results, but which may be made by this means to produce still better ones.

4. It is also recommended that the course of study for cadet-engineers be increased to four years, instead of the two now provided by law; and that they be admitted, according to the present standard of qualifications, at not less than sixteen nor more than twenty years of age. During the first two years of their course, at least, the cadet-engineers could profitably be placed in the same classes with the cadet-midshipmen, taking the same studies throughout, with the simple exception of having steam-enginery in place of seamanship and navigation. The last two years of their course would then be devoted to the higher mathematical and scientific studies, which are essential to a thorough knowledge of their profession. Closely connected with these recommendations is the one that a text-book on steam-enginery adapted to the wants of this department of the Academy, be prepared under the direction of the Secretary of the Navy. The progress made in steam-enginery during the last fifteen years is such that the books now in use are no longer sufficient, and since it is found necessary for the Government to train up its own engineers, it seems desirable that they be instructed in the most approved methods.

5. There is one other recommendation respecting the organization of the Academy which the members of the board agree in considering of greater importance, if possible, than any of those already presented. It is that the heads of academic departments should be placed upon a more permanent footing, and so liberally remunerated that the very best talent in the country could be secured for these places. The heads of such departments as mathematics, chemistry, physics, mechanics, astronomy, international and constitutional law, and others that may perhaps be designated as departments of research, ought to be men of the greatest ability and eminence, whose lives are devoted to the sole business of investigating and teaching their particular subjects. In these days of rapid advancement in every branch of scientific knowledge, no man, however able, can keep fully abreast of discovery, even in his own field, if he is liable to alternations of service on sea and on land. The board wishes distinctly to say that these remarks are intended to be the statement of a general principle, and not, in any sense, a criticism on the ability or success of the gentlemen now holding these positions in the Academy. All of them are believed to be doing their work well, and some of them with exceptional excellence and success. But these would probably be the first to admit that their work would be more satisfactory to themselves and more productive of large results, if it were the pursuit of a life-time rather than a brief tour of duty. It is probably no exaggeration of the truth to say that the one measure which more than any other would enhance the success of the Academy, would be the establishment of a few permanent, well-paid professorships, capable of attracting the very highest order of talent and service.

6. With respect to religious instruction, the condition of the Academy is not all that could be desired. The subject has been considered by the board with the most serious attention; and while they are free to admit the serious difficulties involved in it, a large majority believe that a decided improvement might be effected by a change in the method of appointing the chaplain. It is recommended that, instead of detailing a naval chaplain for a brief term of duty at the Academy, a clergyman be selected, well known for learning, ability, eloquence, and piety, and

with special fitness for wielding an influence over young men, and that the position be placed by law upon such a footing as will secure for it men possessing these qualifications in the highest degree.

III.—SANITARY CONDITION—DISCIPLINE AND DRILL.

With respect to the general condition of the Academy in the matters of health, police, discipline, and drill, the board need only repeat the emphatic commendation already expressed. The health of the cadets is probably as good as that of any similar body of young men in the world. During the last year there have been no deaths, and but very little sickness. The various kinds of exercise secure the double result of preserving a robust physical condition and furnishing a practical training-school. The prescribed routine could hardly be improved upon in these particulars, and every visitor is struck with the appearance of manly vigor and self-possession which the cadets, singly and collectively, present. The board witnessed exercises in nearly every important kind of military and naval drill with very great gratification. The skill, and promptness, and accuracy exhibited were alike creditable to the intelligence of the young men and the faithfulness of their instructors.

The discipline of the Academy, on which all else depends, is in a state of efficiency which leaves nothing to be desired. It is scarcely possible to speak in too high terms of the patience, fidelity, and success with which Superintendent Worden discharges the laborious duties of his position. There seems to be no detail of administration which does not pass under his watchful and careful eye, and nothing which affects the welfare of the institution is too insignificant to enlist his attention. There is in the management of affairs a judicious blending of strictness with a kindly interest in the personal welfare of the cadets, which results in securing a very high standard of discipline and efficiency.

The board has been especially impressed with the earnestness with which the Superintendent has appealed to the honorable instincts of young men, in a series of orders directed against various petty barbarisms, at the same time that he has kindly, but firmly, warned them of the inevitable consequences of a continued course of ill-conduct.

The best commentary on the wisdom of the methods adopted is to be found in the present state of the institution, as it has been already described.

It would be unjust not to mention, in this connection, the ability and faithfulness of the Superintendent's adjutants, the commandant of midshipmen, the heads of departments, and their various assistants. They constitute together a body of men who reflect credit upon the institution and the Government. Some of them bear honored wounds, and others the seeds of disease contracted amid the hardships and perils of an exacting and laborious service. But it may be doubted whether the service which they are now rendering to the country is less important or valuable than that which they were lately called upon to perform amid the sterner scenes of actual war.

In conclusion, the board desires to express its conviction that the more generally the people of the country become acquainted with the affairs of the Naval Academy the more cordially will they insist upon maintaining it at the highest possible standard; and in order that it may be habitually and directly brought to the attention of their representatives, it is respectfully suggested that it might be well to have each House of Congress represented in the Board of Visitors.

It is recommended, also, that the regulations of the Academy relating to police and discipline be carefully revised, and then enacted into law by Congress.

All of which is respectfully submitted.

C. H. DAVIS,
Rear-Admiral and President.
J. J. REYNOLDS,
Col. Third Cav., Bvt. Maj. Gen., Vice-President.
ALVAH SABIN, *Vermont.*
DAVID A. WALLACE, *Illinois.*
G. W. ATHERTON, *New Jersey.*
THOMAS H. DUDLEY, *New Jersey.*
WILLIAM H. HACKETT, *New Hampshire.*
CHAS. G. ROGERS, *Tennessee.*
ALVA A. KNIGHT, *Florida.*
DON A. PARDEE, *Louisiana.*
GEO. HENRY PREBLE,
Captain, United States Navy.
CHARLES H. BAKER,
Chief Engineer, United States Navy.

UNITED STATES NAVAL ACADEMY,
Annapolis, Md., October 27, 1873.

SIR: I have the honor to submit the annual report of the Superintendent of the Naval Academy.

The estimates for the support of this institution for the fiscal year ending June 30, 1875, were transmitted to the Department on the 27th August last.

The number of students in the several classes at the beginning of the academic year 1872–'73 was 262, viz: 233 cadet-midshipmen; 35 cadet-engineers, and 4 Japanese students, as follows:

	Members.	
Cadet-midshipmen—first class	29	
second class	34	
third class	49	
fourth class	115	
		227
Cadet-engineers—first class	15	
second class	20	
		35
Total		262

The course of studies prescribed by the regulations was pursued as usual until the 20th day of May last, when the annual examination of the several classes commenced, and was continued, in the presence of the Board of Visitors, until the 31st of the same month, when it was concluded.

The first, or graduating, class of cadet-midshipmen was composed of 29 members, including Zuu Zow Matzmulla, the first Japanese student educated under the resolution of the Senate and House of Representatives of the United States, approved July 27, 1868. These gentlemen received their certificates of graduation as midshipmen on the 31st of

May. The first class of cadet-engineers, 5 in number, also received their certificates of graduation at the same time, when they were all detached from the Academy, with orders to report their respective places of residence to the chief of the Bureau of Navigation and officer of detail, Washington, D. C.

Mr. Zuu Zow Matzmulla, the Japanese student, was then detached with instructions to proceed to Washington and report to the honorable the Secretary of the Navy for transfer to the authorities of the empire of Japan.

On June 2, all of the members of the present second class of cadet-midshipmen were, under the regulations, granted leave of absence, and on the 4th, the several classes, viz, late second and now first class, 29 members; late fourth and now third class, 56 members; and the transfers to the present fourth class, 16 members, making a total of 101 cadet-midshipmen, were embarked for the practice-cruise on the United States ship Constellation, Commander A. P. Cooke, commanding.

The examination of candidates for admission to the Academy as cadet-midshipmen commenced on the 5th of June, when 83 presented themselves for examination, 6 of whom were withdrawn, and 1 left pending the examination, and 32 were rejected by the academic board, and 44 were found duly qualified and admitted.

The Constellation sailed from her anchorage June 9, and from the outer roads on the 12th, touched at Hampton Roads, leaving the capes, crossed the Gulf Stream, and cruised to the westward of the Bermudas; recrossed the Gulf Stream, and cruised north along the coast between Montauk Point and the capes of the Delaware; touched at Newport, R. I., cruised in the vicinity and adjacent waters of Long Island Sound and Gardiner's Bay; from thence sailed for and cruised in Chesapeake Bay, and arrived in Annapolis Roads on the 27th of September.

The steamer Fortune was detailed and fitted at the navy-yard at Washington, D. C., as a practice-vessel for the practical instruction of the cadet-engineers, and being reported ready to receive her officers, I ordered Lieut. Commander Alexander H. McCormick, United States Navy, to the command fo her, and the other officers detailed for her to proceed to Washington and report to the commandant of the navy-yard on the 16th of June, for duty.

The Fortune was put in commission on June 20th, and on the 24th she got under way for and arrived in Annapolis Roads on the 25th. On the 2d of July the cadet-engineers, 18 in number, were embarked, and on the 5th she proceeded on the practice-cruise, touched at Wilmington, Del., Chester and Philadelphia, Pa., New York City, Cold Spring, and West Point, N. Y., Boston and Charlestown, Mass., and at Washington, D. C., on her return. During her stay at these places the cadet-engineers were treated with much consideration, and, in charge of an officer, visited and inspected all the iron-foundries, rolling-mills, machine-shops, steam and marine engine works, as well as the several navy-yards, &c., and arrived in Annapolis Roads on the 27th of September.

The examination of candidates for admission as cadet-engineers commenced on the 15th, and was concluded on the 25th day of September. During that time 48 presented themselves for examination; 1 was rejected by the medical board, 1 withdrawn pending the examination, and 46 examined, and a report of their proficiency, arranged in order of general merit, was prepared and transmitted to the Department. These young gentlemen were, like the candidates of the last two years, subjected to a thorough competitive examination, but taking into consideration the ages at which they presented themselves, I regret to be com-

pelled to repeat the language of my last two reports, that they did not, on examination, exhibit that proficiency generally which young men of their ages should have acquired. Of the number examined the first 16 were appointed cadet-engineers and received into the Academy on probation.

In this connection I would respectfully recommend that hereafter all the candidates for this corps be required to report on the 15th day of September for examination, instead of the 15th and 25th, as at present prescribed. This would greatly expedite the examination and enable the board to conclude it before the examination of candidates for admission as cadet-midshipmen commenced, and also give to the Department time to appoint the cadet-engineers, and have them here by the 1st day of October of each year.

I beg leave also to state that the experience of the last two years has clearly demonstrated the insufficiency of the time allotted to the course of studies at present prescribed for the classes of cadet-engineers; and, in consideration of the difficulty of obtaining young men duly qualified for admission under the existing regulations, and in order that these students may be given the full advantage of the facilities for instruction offered by the Academy, I recommend that one more academic year be added to the present course of studies now prescribed by law, and that the course be thus modified for three instead of two academic years, as at present.

I would also recommend that a larger and more suitable steamer, of the most approved type of machinery, be detailed for the practical instruction of the cadet-engineers. The Fortune is imperfectly equipped and entirely too small for the accommodation of the classes to be embarked in her.

On the 20th September, the examination of candidates for admission as cadet-midshipmen was renewed; 106 presented themselves for admission, 5 of whom were rejected by the medical board, 51 by the academic board, 1 was withdrawn pending the examination, and 49 were found duly qualified and admitted, making the number found qualified and admitted in June and September, 93, and 1 Japanese student; and the total number of students in the Academy on its re-opening, 276, viz, 236 cadet-midshipmen, 37 cadet-engineers, and 3 Japanese students.

I have also to recommend that hereafter all candidates for admission to the Academy as cadet-midshipmen be required to report for examination between the 5th and 8th of June, and between the 20th and 23d of September, of each year, instead of the 5th and 15th of June, and the 20th and 30th of September, as at present prescribed. This would greatly expedite the examination, give ample time for it, and enable the academic board to conclude it, and be ready, on the arrival of the practice-ship from her summer cruise, to take up and conclude the re-examination before the beginning of the next academic year, viz, 1st of October.

During the last academic year, five candidates for admission to the United States Marine Corps, as second lieutenants, presented themselves for examination, three of whom were found duly qualified for appointment, and two were rejected under the regulations governing their admission.

That the Department may be fully informed relative to the particulars of the cruise of the Constellation and the Fortune, I transmit herewith copies of the reports of Commander Augustus P. Cooke and Lieut. Commander Alexander H. McCormick, the commanding officers of these vessels.

In conclusion, permit me to refer the Department particularly to that portion of the reports of Commander Cooke and Lieut. Commander McCormick, relative to their officers, and to express my gratification at the able and zealous manner in which they performed their duty, and to reiterate my approval of confining the practice-ships to our own coast, where the students can have greater advantages for practical instruction, rather than sending them on long, and, when the weather is unfavorable, tedious passages, thereby rendering their arrival here by the beginning of the next academic year quite uncertain.

I am, sir, very respectfully, your obedient servant,

JOHN L. WORDEN,
Rear-Admiral, and Supt. Naval Academy.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES PRACTICE-SHIP CONSTELLATION,
Annapolis Roads, September 27, 1873.

SIR: I have the honor to submit the following report of the summer's practice-cruise with the first and third classes of cadet-midshipmen embarked for instruction.

The cadet-midshipmen were received on board June 4. The ship sailed from Annapolis June 9, and made her way leisurely down the bay, stopping a short time at Hampton Roads, and finally sailing from the capes of the Chesapeake on the 20th of June.

Steering directly across the Gulf Stream, where the sea was a little rough, but weather quite pleasant, we cruised for a week to the westward of Bermuda. Nearly all the midshipmen were sea-sick during the second day out, but most of them soon recovered. Recrossing the stream, in about the same latitude, with pleasant weather, we came north along the coast, and cruised between Montauk Point and the capes of the Delaware.

On the 20th of July we arrived in Newport for the purpose of recruiting and refreshment. The remainder of the time was passed in that vicinity, and in the adjacent waters of Long Island Sound and Gardiner's Bay, until the 6th of September, when we sailed for the Chesapeake, and arrived inside the capes on the 9th instant. The cruise was continued in the bay until September 27, when we returned to the Academy.

The line-officers of the ship were all detailed from the Academy, and consisted of the usual complement for a sea-going vessel: one executive officer, one navigator, and four watch-officers, together with an assistant navigator, whose special duty was instruction in navigation. Upon these officers devolved, not only the regular duties of the ship, but also the instruction of the cadet-midshipmen—no light task where the time of a hundred young men was to be kept properly employed.

It would be a great advantage to send a special instructor from the department of seamanship, on each practice-cruise. With a larger force of instructors the work could be more thoroughly accomplished.

The senior class consisted of thirty members, all of whom had been on a practice-cruise before; the junior class contained seventy members, most of whom were enjoying their first experience at sea.

The complement of men available for watch duty amounted to about one hundred and fifty. The whole together, men and midshipmen,

formed the ship's company, and were stationed as such; the latter handling the light sails, yards, and masts entirely by themselves. First-class men were selected as captains of each part of the ship, over their own people, and were given charge of the young gentlemen in their own parts, the same as are petty officers ordinarily. At quarters the midshipmen were stationed in guns' crews by themselves.

On the 1st of August the station of each midshipman and all hands was changed so that each should have an opportunity of working aloft and in different parts of the ship. At sea they kept watch and watch during the day, and quarter-watches during the night.

The men were berthed and messed on the gun-deck. It is very essential, for obvious reasons, that the crew of a practice-ship should be of superior quality, yet this one was no exception in that particular to what is found generally in the ships of the service; a large proportion being ignorant of a sailor's duty.

The cadet-midshipmen occupied the whole of the berth-deck, which was fitted up with lockers and tables as a large steerage, the forward part being arranged as a commodious wash-room, and furnished with a bountiful supply of sea-water for bathing purposes.

The midshipmen were divided into a convenient number of mess-crews, occupying the different tables. Before each meal the crews were formed on the lee side of the quarter-deck for muster and inspection under the immediate charge of the mate of the berth-deck, and under the general supervision of the officer of the deck. At these formations all general orders were issued and reports published.

A mess-committee of two of their own number, detailed monthly by themselves, acted as caterers, and had charge of the purchases and expenditures, under the supervision of the executive officer. A steward, cook, baker, and sixteen servants were allowed the midshipmen's mess.

The total mess-bill, including charge for crockery and outfit, averaged about $16 per month. The necessary tin-ware and extra galley-furniture required, cost them over $200 each year. It would reduce their mess-bill somewhat if the Government would allow an outfit of copper utensils for this purpose. In order to get competent men as steward and baker, they have to pay about twice the Government allowance for those rates.

Allowing a liberal expenditure of water, this ship carries sufficient to last about sixty days. The practice-ship should be fitted with the means of condensing water and furnishing her own supply, as it may sometimes be very inconvenient to procure it. This summer, had it not been for the kindness of the authorities at the torpedo station, in assisting us from their limited supply, we should have experienced much delay in replenishing our tanks at Newport.

A quantity of articles, appertaining to a midshipman's outfit, was transferred from the naval store-keeper at the Academy to the paymaster of this vessel, and served out as required. The supply proved ample. Great care should be observed that the midshipmen are furnished with a certain specified outfit complete, before embarking; then the necessity for further supplies would be very rare, except of such articles as are liable to loss or destruction on ship-board.

The officers commanding the divisions of cadet-midshipmen rendered clothing-lists of the outfit on hand each month. In order to accomplish this, they required the midshipmen to furnish invoices of all articles on hand. There was always some difficulty in keeping the lists corrected, as the midshipmen had not been accustomed to such accountability for the supplies received. Great care has always been exercised in scru-

tinizing requisitions; but after an article is once granted, there does not seem to be sufficient care taken that it is properly expended, and articles received on requisition are sometimes irregularly disposed of without authority.

The fatigue-dress worn by the cadet-midshipmen on ship-board is not well adapted to the service, nor is it at all attractive in appearance; and the latter is no mean consideration where it does not involve additional expense, as one's bearing is improved by a consciousness of being becomingly clad. It would be difficult indeed to excite any enthusiasm on the score of personal appearance with the present fatigue costume, and certainly none is exhibited.

The fatigue jumper is an ungainly affair, and should be exchanged for a neat and appropriate dress, such that white shirts could be dispensed with at sea, except on special occasions, when parade-clothes would be worn. This would do away with the immense accumulation of wash-clothes which occurs, and then arrangements could readily be made for having the midshipmen's underclothing washed on board.

The fatigue-cap is a common Scotch affair, which is entirely inappropriate, and should give place to a neat visorless, sailor-looking cap, which would be no more expensive, and far more becoming.

The senior class are required to copy the complete watch, quarter, and station bills of the ship. For this purpose they are furnished blank-books, in which they have to rule all the necessary forms. This is an exceedingly long, tedious, and irksome task, without any compensating benefit. The time could be much more profitably employed, and they could better afford to pay an extravagant price for the printed bills, than to expend the time necessary to make a copy of them.

The practice-cruise is an essential portion of the course at the Academy, for the purpose of giving practical instruction in the professional branches there taught, and to furnish correct ideas of the economy and management of a man-of-war.

In order to make the best use of the time, and to have the course afloat and ashore in harmony, complete regulations and instructions for the guidance of the officers engaged in this important service are as essential as for any other portion of the academic course. It does not appear that such regulations have ever been thoroughly digested and promulgated.

The course of instruction pursued this summer has been as follows:

The senior-classmen were divided into two sections, those in each watch constituting a section. The executive officer and senior watch-officer instructed them in seamanship. They were required to make notes of everything that was done for their instruction, and these notes, when corrected, were copied into their blank-books. The watch below during the forenoon received special instruction in seamanship. This instruction was entirely practical, and comprehended the following points: Working anchor and chain, including bending and unbending lower and sheet chains; bitting and unbitting; bringing to and heaving in with capstan and deck-tackle, and stowing chains in locker; calling and fishing; securing the anchors for sea, and getting them off the bows; carrying out and weighing kedges, with boats, and carrying out bower anchors and forty-five fathoms chain, with boats; letting go, heaving up, and transporting sheet-anchor, from bow to waist; mooring and unmooring, and clearing hawse. Securing yards for purchasing heavy weights; hoisting out and in boats; lowering and hoisting boats at sea, and in a tideway, and the manner of securing them for sea. Making preparations for a gale: reefing down, bending storm-sails, and battening

down hatches. Making preparations for sending down lower yards and topmasts in heavy weather; shifting topsail-yards; bending and unbending sail, and shifting sail both at anchor and under way. Getting under way and anchoring; making, reefing, shortening and furling sail under different circumstances of wind and weather. Also the usual exercises of light yards and masts, loosing and furling sail, &c.

Each individual was given an opportunity of seeing all these things done, of studying them carefully, and then recording the result in note-books, which were afterward submitted for criticism; the object being to teach habits of observation and create an interest in everything pertaining to the practical part of the profession.

During the first half of the cruise a first-classman kept watch with the officer of the deck, and was required to make rough notes of everything that was done, and submit them at the expiration of his tour of duty for the commanding officer's inspection. In these notes they were required to give the routine orders, as well as the reasons for everything done.

In this connection they were given theoretical instruction in the manner of handling sail under different circumstances, and also in the effect of the different disposition of sail upon the ship in the various evolutions.

During the latter half of the cruise the first-classmen were put in charge of the deck and kept regular watches, both at sea and in port, except night-watches at sea, and were each given an opportunity to perform various evolutions, such as tacking and wearing, making and shortening sail, &c.

From the commencement of the cruise they did duty as officer of the forecastle, midshipmen of the quarter-deck, mates of lower decks and hold, and midshipmen of tops, besides regular boat duty. In each of these positions they were instructed in the various duties, particular attention being paid to informing them of the duties of the men in each part of the ship. They were required to heave the lead and steer the ship habitually. Each one was required to make a complete copy of the station-bills, and to keep a copy of the ship's log.

The junior class was divided into three sections, one being taken from both watches, and the other two, each, from one watch. Each section was under the direct supervision of a watch-officer, who was responsible for its instruction in seamanship.

At sea, except in bad weather, the watch below was required to study and make notes of the rigging, &c., and record them in suitable blank-books. The watch on deck was employed in the same manner, when its service could be spared for a sufficient length of time; otherwise, it was taught knotting and splicing, fitting rigging, &c. The officer of the afternoon watch gave his section a special drill with the sails on the mizzen-mast, if the weather was suitable.

The junior-classmen were required to draw the bowsprit and foremast, jib-boom and foretop-mast, flying-jibboom and foretop-gallant-mast, and studding-sail booms, showing all iron-work, &c., and they were required to name and describe each piece of standing rigging on these spars, in its regular order, stating use, lead, manner of fitting and of setting up. They were required to draw each yard on foremast, showing standing-rigging, iron-work, &c.; to draw each sail, and show position of bands, patches, linings, cringles, and gluts; to name and describe the use and manner of fitting and reeving each piece of running rigging used in making, taking in, reefing, and furling each sail, and in working the yards; to name and state the use of each piece of running

rigging used in rigging in and out jib and flying-jib boom; in sending up and down each yard and mast; and to describe the manner of hoisting in and out boats, and of securing yards for purchasing heavy weights. They were also taught knotting, splicing, fitting rigging, and heaving the lead, and were required to take the lee wheel when under way. They were given special exercises in making, shortening, reefing, furling, bending, and unbending sail on mizzen, and in crossing and sending down mizzen top-gallant and royal yards, and housing and fidding mizzen top-gallant-mast. The junior class was also required to keep a copy of the ship's log.

In navigation the instruction was as follows: The senior class was required to take morning time-sights, and meridian altitudes of the sun, or a sight near noon; and in addition to this every opportunity was taken to obtain sights of the moon, stars, and planets, the work on these being added to the usual afternoon work. Those having the forenoon watch were required to take their morning observations before 8 o'clock, and be ready for the duties of the watch by 8.30 o'clock. At 11.30 a. m. they were excused from watch for the purpose of taking meridian observations; and the dinner-hour was at 12.30 o'clock, so that all might dine at the same time. During the afternoon the watch below worked out their observations, and attended to such other work in navigation as might be given them by the instructor. The entire class was required, during the first month at sea, to send in the dead-reckoning daily. Much attention was paid to Sumner's method, which was frequently substituted for the ordinary sights. The variation of the compass was frequently found by azimuth and amplitude. The work was done in books, or copied into them, and sent in every evening for inspection and correction.

In port special attention was given to taking notes of the harbors and roadsteads in which the ship anchored. Sketches of all important points were taken, and descriptions given of the shores, bottom, dangers, day and night marks, tides, &c. This information was written out in full in their navigation-books. Sights were taken on shore with the artificial horizon for the determination of the chronometer-error.

The junior class was taught to work out dead-reckoning, and required to send in the ship's place by account each day. They were divided into small sections and distributed to the first-classmen for instruction in the use of the sextant and nautical almanac. They were also instructed in finding the latitude and longitude by the ordinary meridian altitude and time-sight of the sun.

In port their instruction was the same as at sea, imaginary courses being substituted for the actual run of the ship.

In gunnery the instruction consisted chiefly in target-firing at sea. This was accomplished several times, and the results are forwarded herewith.

Captain Simpson, in charge of the torpedo station at Newport, kindly offered to open his establishment for the inspection of the cadet-midshipmen, and occupied three days in explaining to the senior class, and practically experimenting with the whole torpedo outfit, as now furnished to ships of war. The midshipmen were required to submit in writing an account of what they had seen, and the result proved that most of them had profited by the opportunity.

The officers have all been particularly earnest and zealous in carrying out the objects of the cruise, and I am especially indebted to the executive officer, Lieut. Commander Batcheller, for his very able assist-

ance, whatever success may have attended our efforts being greatly due to his ability, energy, and discretion.

In conclusion, it gives me great pleasure to return in fine health, and without loss or serious accident, the young gentlemen who have been committed to my care. Having behaved excellently throughout, and, as a general rule, improved their opportunities, they are prepared with renewed energy to commence the labors of another academic year.

I am, very respectfully, your obedient servant,

A. P. COOKE,
Commander, Commanding.

Rear-Admiral JOHN L. WORDEN,
Superintendent Naval Academy.

UNITED STATES PRACTICE-SHIP FORTUNE, (4th rate,)
Annapolis, Md., September 30, 1873.

SIR: In obedience to your order I have the honor to submit to you, for the information of the honorable Secretary of the Navy, the following detailed report of the cruise of this vessel.

We were commissioned at the Washington navy-yard on the 20th of June, and on the 24th of that month, having finished our equipment, we proceeded to Annapolis, Md. There, on the 2d of July, we received on board, from the Naval Academy, eighteen cadet-engineers. Until July 5 we were engaged in settling them in their mess arrangements; on that day, with written instructions from you for the practice-cruise, we left the wharf, but ran aground on a shoal in the harbor. At midnight, by the assistance of the United States steamer Phlox, we got afloat, and proceeded on our way to Wilmington, Del., where we arrived on the morning of July 8.

By permission of Mr. Job Jackson, of the firm of Jackson, Sharp & Co., we occupied their wharf. I immediately called at the firms of Pusey, Jones & Co., Harlan, Hollingsworth & Co., Slidell & Hastings, Stottsenberger & Son, the Diamond State Iron-Works, and Lobdell & Co., and asked permission for the cadet-engineers to inspect the works and witness such manufacturing as was then going on, as well as to make sketches of such operations and machinery as were novel or instructive. My request was cordially granted by each of these firms.

Accordingly, on the afternoon of July 8, the entire class of cadet-engineers, under charge of Second Assistant R. Crawford, visited the iron-foundery of E. C. Stottsenberger & Son, where they were shown over the establishment, receiving the personal attention of the firm. During this visit, which lasted over three hours, they witnessed, and had explained to them, the whole operation of making cast-iron castings, from the preparation of the mold to the pouring of the metal, seeing the molding and casting of a "center" for a large paddle-wheel, and of a variety of smaller articles. They also had a chance to examine and make sketches of a pair of air-blast pumps for supplying the blast to the cupolas of the foundery, and of examining, internally and externally, two of the McKenzie pattern of cupolas, said to possess peculiar merit for their manner of distributing the air throughout the charge. The method of "charging" was fully explained, and likewise that of obtaining metal of different grades of hardness.

On the succeeding day the cadets were sent, under Second Assistant Engineer Crawford's charge, to visit the establishments of Lobdell & Co., car-wheel manufacturers, and of Pusey, Jones & Co., engine and

ship builders. At the former of these the cadets were accompanied by the superintendent of the works, who took occasion to point out the leading features and peculiarities of their machinery and special work. Everything relating to the molding and casting and the securing of car-wheels to the axle was fully explained and exemplified, and also the method of chilling cast iron for the purpose of hardening. The cadets witnessed in operation the driving-machinery of this establishment, which is an ingeniously contrived oscillating engine, combining, as it may be made to do, the compound engine, the condensing engine, or the non-condensing engine.

At Messrs. Pusey, Jones & Co's. the cadets were permitted to pass through the works, and witnessed the fitting up of some of the detail parts of a steam-engine. They also visited a large iron vessel on the ways, but without her machinery. They examined, however, the manner of joining the various parts of the vessel.

On the 10th of July the cadets, accompanied as before, visited the plate-iron-rolling mills of Slidell & Hastings, where they had an excellent opportunity of witnessing the various steps in plate-iron manufacture for steam-boilers and for ships, comprising the sorting of the iron with reference to quality, mixtures made to produce desired varieties, the fagoting, piling, weighing, heating, (with the furnace for same,) the handling of the igneous mass by crane and by portable tramway worked by steam-lift, and the process of rolling the mass until reduced to the desired thickness. They had explained to them the effect of the presence of various impurities in the metal, as indicated during the working, and after reduced to the desired shape. The "blooming" process of utilizing fine scrap-iron, such as filings, cuttings, &c., was fully examined. Here copious notes and sketches were made.

In the afternoon the cadets went to the extensive and complete steam railway-car-building shops of Jackson, Sharp & Co., where they were conducted by the senior member of the firm through all departments of the works, and encouraged in the examination of their peculiar machinery, improved car-trucks, patent air-brakes, couplings, &c., rendering the visit highly instructive.

On July 11, by appointment, the cadets visited the marine-engine shop and ship-yard of Harlan, Hollingsworth & Co., everything necessary to facilitate the object of their visit being cordially extended by the members of the firm and by the employés. After a general view of the works, the cadets were distributed through the various departments, such as the boiler-shop, the erecting and fitting-up shops, and the drawing-room, each having assigned to him one or more subjects to sketch and describe. In addition to this, three cadets were sent on board the large iron vessel there building, to make sketches of different parts of the framing, and to describe the manner of joining them together; the manner of securing the stern-bearing and propeller-shaft, and the arrangements of engine and boiler keelsons. Several tracings of drawings were made of the details of engines and boilers.

On July 12 the cadets visited the Diamond State Iron-Works, where they witnessed the process of converting cast into malleable iron, by the process known as "puddling;" the working of the iron to free it of cinder, and the process of refining by cutting, piling, reheating, and rolling. They also saw a number of curious machines for making various kinds of bolts, for making the nuts for them, and for cutting the thread, all of which is said to be done much more expeditiously than is usually the case.

This finished our work at Wilmington, and I beg to state that from

all of the establishments which the cadets visited, with the exception of that of Pusey, Jones & Co., they received great attention, and every facility for profitable instruction was extended to them.

From Mr. Job Jackson, who allowed us to occupy his wharf free of rent, we received much other kindness.

From this, on July 12, we proceeded to Chester, Pa., as directed, and anchored in the stream, where we remained until the 21st. I called at the office of Messrs. Roach & Son, the proprietors of the extensive iron-ship-building yard at this place, explained the design of our cruise, and obtained permission for the cadets to visit their works. Accordingly, on July 15, the cadets, accompanied at all times by Second Assistant Engineer R. Crawford, commenced inspecting these works. To enable them to transfer to their smooth journals the drawings and notes taken at Wilmington and at this place, only one-half of the class visited the yard each day, and at first a general view of the establishment was had. On succeeding trips, the details were entered upon. Here they had an excellent opportunity of familiarizing themselves with all that pertains to iron-ship building, the establishment being complete in all respects, and the superintendent, Mr. Boole, extremely obliging. No less than five iron vessels in different stages of construction were on the ways, and six others were in the water being fitted up and receiving their machinery. Two of those on the ways were very large; said to be 428 feet in length over all. The attention of the cadets was specially directed to these iron vessels. The methods of forming, setting, and securing the frames; the construction of the various kinds of keels and keelsons, with the merits and demerits of each, were duly noted; the different methods of strengthening special parts, the use of stringer-plates and stringers, tie-plates, &c., were pointed out. Afterward they made copious notes and sketches of the detail parts of engines, boilers, and vessels in process of erection. They were instructed in the manner of constructing each of these, with the various technicalities pertaining thereto. The drawing-room was visited, and useful data of engines, &c., obtained.

At another visit, details of cadets were set at work on assigned objects to sketch and describe, a notable feature being the engines and appurtenances of the Colima, an iron ship for the Pacific mail-line, fitted with machinery of improved compound type. We remained here until July 21, all of which time was devoted to the instruction of the cadets, and, I think, with great profit to them. From this we went to the Philadelphia navy-yard for a supply of coal, and there we also filled our complement of men (which was somewhat reduced by desertions) from the receiving-ship.

On July 23 we started for the Brooklyn navy-yard, where we arrived on the 24th, and permission was given us to occupy a berth at the cob-dock, and to obtain all the information possible from the machinery in the yard and on board the vessels there. Accordingly, commencing on July 28, the cadets, in two divisions, the first under charge of Second Assistant Engineer R. Crawford, and the second under Second Assistant J. S. Ogden, on alternate days, continued visiting until August 4. During that time they were engaged in taking notes, and in making sketches in the founderies, boiler-shops, and machine-shops, where the work going on was explained to them; in collecting data pertaining to the machinery of the vessels in ordinary, and in viewing and sketching parts of their machinery. For this purpose the Frolic, the flag-ship of Vice-Admiral Rowan, was also visited. They were unsuccessful in obtaining information concerning the engines, &c., of the torpedo-boat

now building, but visited and made sketches of her hull. On August 4 I obtained a steam-launch from the yard, and sent all of the cadets to the Morgan Iron-Works, in the city of New York. As these are directly connected with the ship-yard at Chester, I deemed them especially important. They were shown through these works first, and then distributed through the various departments, and to the vessels here receiving machinery. Many compound engines are built here. Much useful data respecting the practical operations of compound engines at sea was obtained. As the whole object of the visit could not be accomplished in one day, a detail of four cadets was sent over the next morning, and employed in the collection of data, and in sketching and obtaining information respecting the efficiency of various types of screw-propellers. At these works the use of the drawing-room, drawings, &c., was accorded the cadets, and First Assistant George P. Hunt gave material assistance.

On August 8 the cadets were kept on board working on their journals, copying the indicator-diagrams of various vessels fitted with compound engines, and in copying data for computing their respective horse-power, and cost, in fuel, per horse-power, in each case.

I confined our attention to the Morgan Works and to the navy-yard, thinking they offered enough for the profitable employment of our time, and because of the difficulty of getting to other establishments.

On August 9 we left the Brooklyn navy-yard for Cold Spring, on the Hudson, where we arrived at 2.40 p. m. of the same day. I called, that afternoon, at the West Point Foundery, and at the smelting-furnace of Brock & Co., and obtained permission for the cadets to inspect them. At the former, very little work of interest was at the time being done; but the cadets were shown over the foundery and saw some large blower-engines under construction, and also a breech-loading cannon composed of a cast-iron shell, with a steel cylinder forced in. At the smelting-furnace, however, much valuable information was obtained. They had a good opportunity to investigate thoroughly the process of smelting the ores and casting pig-iron of different qualities. The composition of the ores and fluxes used here was also explained to them. As this was the first opportunity the class had had to witness the reduction of the ore, I consider the visit was highly advantageous to them.

On August 15 we dropped down the river to West Point, and that afternoon I permitted all of the cadet-engineers to visit the Military Academy, and such as desired, to attend the cadets' hop that night.

On the 16th we returned to the Brooklyn navy-yard for a supply of coal.

On August 19 we sailed for Boston by way of Long Island Sound. The weather getting foggy, we sought a harbor on the morning of the 20th at Holmes's Hole, Martha's Vineyard, where we remained a day, and on the evening of the 21st of August we arrived at the Charlestown navy-yard. Here, every facility was given to us to accomplish the object of our visit. The cadet-engineers, under their instructors, visited all of the departments of the yard, examining the machinery and taking notes and drawings. Especial attention was given to the improved method here employed of fitting up compound-engine boilers; to the timber-bending machine; to the rope-walk, and to the extensive selection of tools. The cadets also visited the Franklin, where preparations were being made for the removal of her boilers, and their attention was directed to those parts which had suffered most from use and corrosion, with hints as to the care to be taken with them.

On Thursday, August 28, I called upon the proprietors of the Bay

State and the Norway Iron-Works, and obtained permission for the cadets to inspect them. The next day the entire class, with the instructors, visited these works, and had every facility extended for a thorough investigation. At the Norway Works, the method of making steel by the "cementation" process was seen, and all that could be learned concerning it duly noted. The manner of making coarse iron wire was also witnessed, and the machinery examined.

At the Bay State Works an opportunity was had for seeing the Siemen-Martin process of converting iron into steel, and tracings of the furnace obtained. The puddling of iron was likewise seen, and the process of refining and working into boiler-plates. These works, and the machinery, &c., at the navy-yard, comprised all that was considered of special interest at this place; and accordingly, on the afternoon of the 2d September, after having taken a supply of coal, &c., we sailed from Boston for the Washington navy-yard, where we arrived on the morning of September 7, having sought a harbor inside of Sandy Hook for twenty-four hours, in consequence of threatening weather.

We remained at the Washington navy-yard until September 26. That time was employed in visiting its various shops, attention being given principally to the cap and nail machines; to the fitting up of compound-engine cylinders; to the Rodman iron-testing machine; to the heavy anchor-forgings; to the copper-shops; and to the engines of the Gettysburg. Much of the machinery here seen was of the same type as that already inspected; but the instruction, as a review, was considered valuable. On September 22 and 23 the cadets were taken through the model-rooms of the United States Patent-Office, where they examined the models of the latest improvements in valve-gear; in piston-packing; in governors; in the various engines, rotary, direct-acting, and oscillating, and in paddle-wheels and screws, the cases being opened for the purpose.

We returned to the Naval Academy on the morning of September 27, and on the 29th the cadet-engineers were landed.

I take pleasure in stating that, throughout the cruise, the conduct of the cadets has been good, and their attention to duty commendable.

The instructors, Second Assistant Engineers R. Crawford and J. S. Ogden, were zealous in the performance of their duties.

I have the honor to be, admiral, very respectfully, your obedient servant,

ALEXANDER H. McCORMICK,
Lieutenant-Commander, Commanding.

Rear Admiral JOHN L. WORDEN, *U. S. N.*,
Superintendent United States Naval Academy.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1875, by the Naval Academy.

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
NAVAL ACADEMY.		
Pay Naval Academy:		
Pay of professors and others:		
One professor of drawing, (head of department)	$2,500 00	
Four professors, viz: One of mathematics, (assistant,) one of chemistry, one of English studies, history, and law, and one of French, at $2,200 each, (appropriated, 17 Stat. at L., p. 153)	8,800 00	
Twelve assistant professors, viz: Four of French, one of Spanish, three of English studies, history, and law, one of mathematics, one of astronomy, and two of drawing, at $1,800 each, (appropriated, 17 Stat. at L., p. 153)	21,600 00	
Sword-master, at $1,500, and two assistants, at $1,000 each, (appropriated, 17 Stat. at L., p. 153)	3,500 00	
Boxing-master and gymnast, at $1,200, and assistant librarian, at $1,400, (appropriated, 17 Stat. at L., p. 153)	2,600 00	
Three clerks to Superintendent, at $1,200, $1,000, and $800 each, (appropriated, 17 Stat. at L., p. 153)	3,000 00	
One clerk to commandant of midshipmen, (appropriated, 17 Stat. at L., p. 153)	1,000 00	
One clerk to paymaster, (appropriated, 17 Stat. at L., p. 153)	1,000 00	
One apothecary, (appropriated, 17 Stat. at L., p. 153)	750 00	
One commissary, at $288; one cook, at $325.50; and messenger to Superintendent, at $600, (appropriated, 17 Stat. at L., p. 153)	1,213 50	
One armorer, at $529.50; gunner's mate, at $469.50; and quarter-gunner, at $409.50, (appropriated, 17 Stat. at L., p. 153)	1,408 50	
One coxswain, at $469.50; and three seamen in department of seamanship, at $349.50 each, (appropriated, 17 Stat. at L., p. 153)	1,518 00	
One band-master, at $528; and eighteen first-class musicians, at $348 each, (appropriated, 17 Stat. at L., p. 153)	6,792 00	
Seven second-class musicians, at $300 each; two drummers and one fifer, (first class,) at $348 each, (appropriated, 17 Stat. at L., p. 153)	3,144 00	
	58,826 00	$58,576 00
Estimate of appropriations required under head of pay of professors and others, for the fiscal year ending June 30, 1875	58,826 00	
Amount appropriated under head of pay of professors and others, for the fiscal year ending June 30, 1874	58,576 00	
Excess	250 00	

NOTE.—It will be seen that a change is proposed in this estimate, occasioned by the expediency of assigning a commissioned professor of mathematics in the Navy as the head of the department of mathematics, and of transferring the civil professor to the department of drawing, as its head, at the same salary, viz, $2,500 per annum, which he received as head of the department of mathematics, (authority, Navy Department, August 2, 1873;) also, that this estimate is $250 in excess of that of last year, and is occasioned by an increase of pay recommended for the sword-master, whose present compensation is inadequate to the support of his family, and by no means commensurate with the service he renders.

Pay of watchmen and others:		
Captain of the watch, at $2.50 per diem	912 50	
Four watchmen, at $2.25 per diem each	3,285 00	
Foreman of the gas and steam-heating works, at $5 per diem	1,825 00	
Twelve attendants at gas and steam-heating works of Academy, at new quarters for cadet-midshipmen and at school-ships—one at $3.50, three at $3, and eight at $2.50 per diem each	11,862 00	
Three joiners, two painters, and two masons, at $3.50 per diem each	8,942 50	
One tinner, one gas-fitter, and one blacksmith, at $3.50 per diem each	3,832 50	
	30,659 50	30,659 50
Pay of mechanics and others:		
One mechanic at workshop, at $2.25 per diem	821 25	
One master laborer to keep public grounds in order, at $2.28 per diem	832 20	
Fourteen laborers to assist in same, three at $2 per diem each, and eleven at $1.75 per diem each	9,216 25	
One laborer to superintend quarters of cadet-midshipmen, public grounds, &c., at $2 28 per diem	832 20	
Four attendants at recitation-rooms, library, chapel, and offices, at $20 per month each	960 00	
Twenty servants to keep in order and attend to quarters of cadet-midshipmen, public buildings, &c., at $20 per month each	4,800 00	
	17,461 90	17,461 90

Estimates of appropriations required by the Naval Academy, &c.—Continued.

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
Pay in department of steam-enginery:		
One machinist, at $3.50 per diem	$1,277 50	
One machinist, at $3 per diem	1,095 00	
One blacksmith, at $3.50 per diem	1,277 50	
One boiler-maker, at $3.50 per diem	1,277 50	
One pattern-maker, at $3.50 per diem	1,277 50	
One molder, at $3.50 per diem	1,277 50	
Two laborers, at $1.75 per diem each	1,277 50	
	8,760 00	8,760 00
Repairs and improvements at Naval Academy:		
For the necessary repairs and improvements of public buildings, for furniture and fixtures, for renewing pavements, and for repairing wharves and walls inclosing the grounds of the Academy	14,000 00	14,000 00
Contingent expenses, Naval Academy:		
For materials for heating and lighting the Academy, and school-ship quarters	19,000 00	
For the purchase of books for the library	2,000 00	
For stationery, blank-books, models, maps, &c., and for text-books for use of instructors	2,000 00	
For expenses of the Board of Visitors	2,000 00	
For printing and binding	2,000 00	
For postage on public service	*750 00	
For expenses in the astronomical and philosophical departments	800 00	
For the purchase of gas and steam machinery, steam-pipe and fixtures, rent of buildings for use of the Academy, freight, cartage, water, music and musical instruments, uniforms for bandsmen, telegraphing, and for the current expenses and repairs of all kinds, and for incidental labor and expenses not applicable to any other appropriation	34,000 00	
For stores in the department of steam-enginery	800 00	
For material for repairs of steam-machinery	1,000 00	
	64,350 00	64,000 00
RECAPITULATION.		
Pay of professor and others	58,826 00	
Pay of watchmen and others	30,659 50	
Pay of mechanics and others	17,461 90	
Pay in department of steam-enginery	8,760 00	
Repairs and improvements	14,000 00	
Contingent expenses	64,350 00	
	194,057 40	193,457 40

* Excess of $3.50 in this estimate is made necessary by the repeal of the franking privilege.

Respectfully submitted.

JOHN L. WORDEN,
Rear-Admiral United States Navy, and Superintendent Naval Academy.

UNITED STATES NAVAL ACADEMY, *September* 1, 1873.

No. 3.

BUREAU OF EQUIPMENT AND RECRUITING.

NAVY DEPARTMENT,
BUREAU OF EQUIPMENT AND RECRUITING,
Washington, October 25, 1873.

SIR: I have the honor to submit herewith the annual report of the operations of this bureau, together with the estimates for the fiscal year ending June 30, 1875.

During the past fiscal year 75 vessels have been either partially or

wholly equipped at the several navy-yards, at an expenditure, including labor and material, of $832,794.54.

Thirty-seven thousand four hundred forty-five and one-fourth tons of coal have been purchased, at home and abroad, at a cost of $400,071.76, and 200⅔ tons of manila hemp have been purchased, costing $72,832.50.

The rope-walk at the Charlestown navy-yard has supplied the wants of the service with hemp and manila rope; 304¾ tons of hemp of both kinds have been manufactured into rope. The bureau expects soon to have the wire-rope machinery in operation, for the manufacture of wire rope.

The equipment-shops at the Washington navy-yard have supplied all the wants of the service for anchors, chains, galleys, &c.

The complement of men allowed (8,500) has not been exceeded within the year. During the summer enlistments fell off and reduced the number of men on hand to 7,500. At present recruiting is more active, and the complement is filling up.

Every year's experience in enlisting men for the naval service makes the difficulty of procuring men the more apparent, and the necessity of providing by law for the establishment of a system of apprenticeship adapted to the wants of the Navy more and more requisite.

The former recommendations of the bureau as to furnishing enlisted men with an outfit on entering the service, and as to apprehending deserters after the time of their enlistment has expired, and causing them to serve out their lost time, as is the case in the Army, are respectively renewed.

I have the honor to be, very respectfully, your obedient servant,

WM. REYNOLDS,
Chief of Bureau.

Hon. GEO. M. ROBESON,
Secretary of the Navy.

E. & R. No. 1.

Estimate of the amount required for the support of the Bureau of Equipment and Recruiting for the fiscal year ending June 30, 1875.

For salary of chief clerk, (act July 5, 1862)		$1,800
For salary of one fourth-class clerk, (act July 23, 1866)		1,800
For salary of one third-class clerk, (act of July 23, 1866)		1,600
For salary of two second-class clerks, (act July 12, 1870)		2,800
For salary of two first-class clerks, (act July 23, 1866)		2,400
For salary of one messenger, (act March, 1867)		840
For salary of one laborer, (act July 12, 1870)		720
		11,960
For contingent expenses, stationery, books, and miscellaneous items		800
		12,760
Appropriated for the fiscal year ending June 30, 1874		12,710

E. & R. No. 2.

Estimate of the amount required for the purchase of materials, articles, &c., for the equipment of vessels in the Navy for the fiscal year ending June 30, 1875.

For the purchase of various articles of equipment, viz, coal for steamers' use and fuel for ship's use, including expenses of transportation, storage, labor, hemp, wire, and other materials for the manufacture of rope, hides, cordage, canvas, leather, iron for manufacture of cables, anchors, and galleys, condensing and boat-detaching apparatus, furniture, hose, bake-ovens and cooking-stoves, life-rafts, heating-apparatus for receiving-ships, and for the payment of labor in equipping vessels and manufacture of articles in the navy-yards pertaining to this bureau $1,500,000
Appropriated for the fiscal year ending June 30, 1874..... 1,500,000

E. & R. No. 3.

Estimate for pay for the fiscal year ending June 30, 1875.

For pay of commissioned and warrant officers at sea, on shore, on special service, and those on the retired list and unemployed, and for mileage or transportation of officers traveling under orders, and for pay of the petty officers, seamen, ordinary seamen, landsmen, and boys, including men for the engineers' force and for the Coast Survey service, 8,500 men, at an average pay of $300 per annum..... $6,500,000
Appropriated for the fiscal year ending June 30, 1874..... 6,250,000

E. & R. No. 4.

Estimate of the amount required for the pay of civil officers under the cognizance of the Bureau of Equipment and Recruiting for the fiscal year ending June 30, 1875.

PORTSMOUTH, N. H.

Clerk in equipment office..... $1,400
Store clerk, $1,100; time clerk, $900..... 2,000

BOSTON.

Superintendent of rope-walk..... 1,900
Clerk to same..... 1,200
Clerk in equipment office..... 1,500
One time and one store clerk, $1,200 each..... 2,400

PHILADELPHIA.

Clerk in equipment office..... 1,400
One time and one store clerk, $1,200 each..... 2,400

WASHINGTON.

Clerk in equipment office..... 1,500
One store clerk, $1,400; one time clerk, $1,200..... 2,600

BROOKLYN, N. Y.

Clerk in equipment office..... 1,500
One store and one time clerk, $1,200 each..... 2,400

PENSACOLA.

Clerk in equipment office..... 1,300

NORFOLK.

Clerk in equipment office..... 1,400
Store clerk, $1,125; time clerk, $900..... 2,025

MARE ISLAND, CAL.

Clerk in equipment office..... 1,875
One store clerk..... 1,200
——— $30,000
Appropriation for the fiscal year ending June 30, 1874..... 30,000

E. & R. No. 5.

Estimate of the amount required for contingent expenses of the Bureau of Equipment and Recruiting for the fiscal year ending June 30, 1875.

For expenses that may accrue for the following purposes, viz: Contingent expenses of Bureau of Equipment and Recruiting, for recruiting; freight and transportation of stores; transportation of enlisted men; expenses of auction sales; advertising; telegraphing; books and models; stationery; express charges; internal alterations and fixtures in equipment buildings at navy-yards; foreign postage; ferriages and car-tickets; ice; apprehension of deserters; assistance to vessels in distress, and good-conduct badges for enlisted men	$125,000
Appropriated for the fiscal year ending June 30, 1874	125,000

E. & R. No. 6.

Estimate of the amount required for public printing under Bureau of Equipment and Recruiting for the fiscal year ending June 30, 1875	$6,000

RECAPITULATION.

For salaries	11,960
For contingent	800
	12,760

NAVAL SERVICE.

Equipment of vessels	$1,500,000
Pay of the Navy	6,500,000
Pay of civil employés	30,000
Contingent, equipment, and recruiting	125,000
Public printing	6,000
	8,161,000

E. & R. No. —.

Abstract of offers for supplies (embracing as well those which are rejected as those which are accepted) received for furnishing articles coming under the cognizance of the Bureau of Equipment and Recruiting, made in conformity to the act of Congress approved March 3, 1843, under advertisement of May 26, 1873.

FOR THE NAVY-YARD AT KITTERY, ME.

Class No. 3. Cotton hammock, bag and cot stuff:

George H. Creed	*$1,560 00
Brinckerhoff, Turner & Co.	1,700 00

Class No. 8. Hardware:

David Babcock & Co	*138 55
G. H. Creed	174 60
Hyatt & Spencer	145 74

Class No. 15. Brushes:

D. Babcock & Co	*36 00
G. H. Creed	61 00
Hyatt & Spencer	38 46

Class No. 16. Ship-chandlery:

D. Babcock & Co	$281 10
G. H. Creed	*241 50
Hyatt & Spencer	280 50

Class No. 18. Stationery:

A. S. Barnes & Co	166 75
James H. Foster	120 56
W. H. Dempsey	*117 20

Class No. 19. Dry-goods:

D. Babcock & Co	232 50
G. H. Creed	*159 00
Hyatt & Spencer	244 75

Class No. 22. Paints and oils:

D. Babcock & Co	261 75
G. H. Creed	*243 80
Hyatt & Spencer	261 30

*Accepted.

FOR THE NAVY-YARD AT CHARLESTOWN, MASS.

Class No. 3. Cotton hammock, bag and cot stuff:

George H. Creed	*$3,370 00
Brinckerhoff, Turner & Co	3,900 00

Class No. 8. Hardware:

George H. Creed	128 30
Hyatt & Spencer	128 11
D. Babcock & Co	*99 08

Class No. 12. Leather:

G. H. Creed	*410 00
Hyatt & Spencer	†402 20
D. Babcock & Co	477 20
Walton Brothers	435 20

Class No. 14. Ox-hides for rope:

George H. Creed	*13,800 00
Hyatt & Spencer	14,925 00
D. Babcock & Co	$16,500 00
Walton Brothers	16,875 00

Class No. 17. Tar and tar-oils:

George H. Creed	*2,588 00
Hyatt & Spencer	3,033 00
D. Babcock & Co	2,888 00

Class No. 18. Stationery:

A. S. Barnes & Co	136 50
William H. Dempsey	*121 90

Class No. 22. Paints and oils:

G. H. Creed	1,025 30
Hyatt & Spencer	1,069 46
D. Babcock & Co	1,278 05

FOR THE NAVY-YARD AT WASHINGTON, D. C.

Class No. 4. Iron and steel:

George H. Creed	*$64 75
D. Babcock & Co	85 40
Hyatt & Spencer	76 12

Class No. 5. Galley-iron:

D. Babcock & Co	*417 50
George H. Creed	600 00
Hyatt & Spencer	565 00

Class No. 6. Pig-iron:

D. Babcock & Co	1,312 50
G. H. Creed	*1,237 50

Class No. 7. Chain-iron:

D. Babcock & Co	1,862 50
G. H. Creed	*1,513 87
Hyatt & Spencer	†1,428 25

Class No. 8. Hardware:

D. Babcock & Co	*126 04
G. H. Creed	142 50
Hyatt & Spencer	†123 54

Class No. 10. Tools:

Hyatt & Spencer	†377 83

Class No. 12. Leather:

D. Babcock & Co	$260 50
G. H. Creed	*202 60
Hyatt & Spencer	206 97

Class No. 15. Brushes:

D. Babcock & Co	*34 00
G. H. Creed	60 00
Hyatt & Spencer	†43 80

Class No. 16. Ship-chandlery:

D. Babcock & Co	193 20
G. H. Creed	*149 10
Hyatt & Spencer	161 34

Class No. 17. Tar and tar-oils:

D. Babcock & Co	*145 25
G. H. Creed	253 50
Hyatt & Spencer	149 00

Class No. 18. Stationery:

A. S. Barnes & Co	44 30
William H. Dempsey	*39 45

FOR THE NAVY-YARD AT BROOKLYN, N. Y.

Class No. 8. Hardware:

G. H. Creed	*$482 00
D. Babcock & Co	894 60
Hyatt & Spencer	515 25

Class No. 16. Ship-chandlery:

G. H. Creed	*308 15
D. Babcock & Co	403 17
Hyatt & Spencer	†307 75

Class No. 18. Stationery:

A. S. Barnes & Co	$273 80
William H. Dempsey	*236 80

Class No. 20. Fire-wood:

D. Babcock & Co	*280 00

Class No. 22. Paints and oils:

G. H. Creed	*404 60
D. Babcock & Co	700 65
Hyatt & Spencer	473 67

* Accepted.

† Rejected.

FOR THE NAVY-YARD AT PHILADELPHIA.

Class No. 8. Hardware:

Hyatt & Spencer	$171 25
D. Babcock & Co	*142 05
Paul J. Field	203 50
George H. Creed	168 50

Class No. 18. Stationery:

A. S. Barnes & Co	54 34
Paul J. Field	$58 94
William H. Dempsey	*34 83

Class No. 16. Ship-chandlery:

Hyatt & Spencer	†397 25
D. Babcock & Co	*456 40
P. J. Field	772 75
George H. Creed	482 40

FOR THE NAVY-YARD AT NORFOLK, VA.

Class No. 3. Cotton hammock, bag and cot stuff:

George H. Creed	*$2,645 00
Brinckerhoff, Turner & Co	2,850 00
Brinckerhoff, Turner & Co	3,562 50
Staples, Peed & Co	3,250 00

Class No. 4. Iron and steel:

D. Babcock & Co	19 00
Hyatt & Spencer	22 75
George H. Creed	*14 00

Class No. 8. Hardware:

D. Babcock & Co	*243 00
Hyatt & Spencer	†236 65
George H. Creed	294 70

Class No. 9. Cooking-utensils:

D. Babcock & Co	*178 56
Hyatt & Spencer	187 56
George H. Creed	211 80

Class No. 12. Leather:

D. Babcock & Co	95 20
Hyatt & Spencer	†73 78
G. H. Creed	*88 06

Class No. 15. Brushes:

D. Babcock & Co	28 40
Hyatt & Spencer	21 25
George H. Creed	*17 80

Class No. 16. Ship-chandlery:

D. Babcock & Co	$343 80
Hyatt & Spencer	317 23
George H. Creed	*301 58
Staples, Peed & Co	444 50

Class No. 17. Tar and tar-oils:

William A. Wood	208 12
D. Babcock & Co	220 00
Hyatt & Spencer	217 25
G. H. Creed	*184 80
Staples, Peed & Co	662 20

Class No. 18. Stationery:

A. S. Barnes & Co	167 30
William H. Dempsey	*76 82

Class No. 19. Dry-goods:

D. Babcock & Co	185 40
Hyatt & Spencer	189 94
G. H. Creed	183 80

Class No. 20. Fire-wood:

D. Babcock & Co	†325 00

Class No. 22. Fire-wood:

Wertzner, Shieve & Willey	228 05
D. Babcock & Co	*188 70
Hyatt & Spencer	199 11
G. H. Creed	193 33
Staples, Peed & Co	230 40

* Accepted.

† Rejected.

No. 4.

BUREAU OF YARDS AND DOCKS.

BUREAU OF YARDS AND DOCKS, NAVY DEPARTMENT,
Washington, D. C., November 13, 1873.

SIR: I have the honor to submit the annual report of the Bureau of Yards and Docks, with estimates for improvements, repairs, and contingent expenses for the next fiscal year.

I beg leave to renew the recommendations offered in my last annual report, and especially to urge caution should an effort be made to alienate a portion of the navy-yard at New York. It is our most valuable navy-yard, admirably placed, and our great resource in time of war. Its marsh-lands are being rapidly filled up, without cost to the Government, by private persons using them as a dumping-ground for the earth taken from the excavations of the city, and I trust that no heed may be given to the speculators who approach Congress with specious recommendations, hoping to make their profit out of the sale of land invaluable to the Navy.

At Philadelphia, in obedience to the will of Congress, a large quantity of material has been removed from the old navy-yard to the new one at League Island; the cannon, the shot and shells, the anchors and chain-cables, and a portion of the timber, are already transferred; the foundation of the great iron-plating shop for construction is in progress, and the large and carefully-built store-house, workshop, and machine-shop for yards and docks are nearly completed.

An area equal to that of the old navy-yard has been filled and raised to the permanent grade adopted for the new yard.

No difficulty is found in securing a perfectly solid foundation for the new buildings at a moderate cost, and if Congress will have the old yard carefully valued, and appropriate a sum equal to this value to be expended in renewing on League Island the present establishment at Philadelphia, the old yard might soon be abandoned to its purchasers and the Treasury re-imbursed for the money advanced.

Since my last annual report I have carefully examined the navy-yard at Mare Island, and I beg to renew the statements and recommendations I made in my report of last year.

It is of especial importance that liberal appropriation should be made for the quay-wall on the water-front, not only to afford ample wharf-room for our ships, but to prevent the filling of the channel by mud.

A clear, unbroken quay-wall, carefully placed, will cause the tide to scour the navy-yard front, and thus prevent the deposit of earth now so fruitful of mischief and expense.

The system of hydraulic mining prevalent in California has loaded the rivers with earth, and has greatly increased the mud-deposit on our water-front.

The excavation of the dry-dock has been nearly completed, and the laying of masonry is about to begin.

A board of civil engineers is now in session at Mare Island, studying the most economical and best plan for developing and improving the resources of this admirable site for our great Pacific navy-yard.

In February last a board, of which Rear-Admiral John Rodgers was the senior member, made a careful examination of the navy-yard at Pensacola, and strongly recommended that some of the buildings destroyed during the war should be rebuilt, and that the navy-yard should

not be removed from its old site. This yard would be of great importance in the event of our needing a large squadron in the Gulf of Mexico or West Indies, and I concur in the recommendations of the board, and respectfully urge that a liberal appropriation be made to put the navy-yard in good working order as a second-class yard.

A proper naval prison at one of our navy-yards is greatly needed. Our sailors and marines under sentence of courts-martial are crowded into cells at the marine barracks in a manner contrary to the humane spirit of the age, and ruinous to that hope of reform which well-regulated prisons encourage. Two men are of necessity placed in a cell not large enough for one, badly ventilated and drained, and generally insecure. Such confinement produces indecency and vicious habits, and I cannot too strongly urge an ample appropriation to remedy such a crying evil.

Our prisoners now pass their time in wretched idleness, but, under a better system, their labor would provide for their support, and perhaps lead to reformation. Lieutenant-Colonel Broome, of the Marines, has, under the direction of this bureau, examined the prisons of the Northern States, and has carefully and intelligently stated the need of the Navy in this particular, and the best method of meeting it. His excellent report is already in your hands.

KITTERY, ME.

At this navy-yard there has been expended under the appropriation, "navy-yard, Kittery, Me.," during the fiscal year ending 30th June, 1873, for materials, $45,520.66, and for labor $118,862.66, making an aggregate of $164,383.32. A large portion of this expenditure has been for very extensive repairs to the floating-dock, and in building a bridge between the navy-yard proper and Seavey's Island; the balance for the repairs of the various buildings, docks, roads, &c. Under head of "emergencies at naval stations" there has been expended $1,000. The amount expended under the appropriation "civil establishment" is $9,424.50. For various objects coming under the head of "contingent," has been expended the sum of $98,558.76.

Estimates are submitted for the fiscal year ending 30th June, 1875, for navy-yard, Kittery, Me., $103,000, for the following objects: For repairs of all kinds; for civil establishment, navy-yard, Kittery, Me., $9,100.

CHARLESTOWN, MASS.

The amount expended at this yard under the appropriation, "navy-yard, Charlestown, Mass.," during the fiscal year ending 30th June, 1873, is for materials, $32,428.12, and for labor $47,383.59, making an aggregate of $79,811.71, all of which has been expended in making the necessary repairs to the various buildings, offices, docks, wharves, roads, fences, &c. Under the head of "emergencies at naval stations," there has been expended the sum of $4,215.07. The amount expended under the appropriation for "civil establishment," is $12,239.40, and for various items under head of "contingent," is $139,144.97.

Estimates are submitted for the fiscal year ending 30th June, 1875, for navy-yard, Charlestown, $137,500., for the following objects, viz: Repairs of all kinds; for civil establishment, navy-yard, Charlestown, Mass., $11,900.

BROOKLYN, N. Y.

The amount expended at this yard under the appropriation "navy-yard, Brooklyn," during the past fiscal year is, for materials $16,435.99,

and for labor $109,108.18, making in the aggregate the sum of $125,544.17. Under the head of "emergencies at naval stations," there has been expended for materials, $372.95, and for labor $2,654.10, making an aggregate of $3,027.05. The amount expended under head of "civil establishment," is $12,074.90, and under the various items coming under the head of "contingent," is $170,382.21.

Estimates are submitted for the fiscal year ending 30th June, 1875, for navy-yard, Brooklyn, $152,000, for the following objects, viz: Repairs of all kinds; for civil establishment, navy-yard, Brooklyn, N. Y., $12,800.

PHILADELPHIA, PA.

The amount expended at this yard during the fiscal year ending June 30, 1873, under appropriation "navy-yard, Philadelphia," is for materials $11,888.42, and for labor $30,868.80, amounting in the aggregate to $42,757.22, all of which has been for current repairs and for dredging channels. The amount expended under head of "civil establishment" is $8,756.22, and for the various items coming under the head of "contingent," $72,813.27.

Estimates are submitted for the fiscal year ending June 30, 1875, for navy-yard, Philadelphia, $78,000, for repairs of all kinds; for civil establishment, navy-yard, Philadelphia, Pa., $11,100.

WASHINGTON, D. C.

There has been expended at this yard under the appropriation "navy-yard, Washington," during the fiscal year ending June 30, 1873, for materials $13,681.70, and for labor $61,256.76, making an aggregate of $74,938.46, all of which has been for repairs of the various buildings, docks, &c. Under the head of "emergencies at naval stations" there has been expended the sum of $1,000. The amount expended under head of "civil establishment" is $10,200, and under "appropriation contingent," $94,065.56.

Estimates are submitted for the fiscal year ending June 30, 1875, for navy-yard, Washington $100,000, for the following objects viz: For repairs of all kinds; for civil establishment, navy-yard at Washington, D. C., $10,100.

NORFOLK, VA.

The amount expended during the fiscal year ending June 30, 1873, under the head of "navy-yard, Norfolk," is for materials $23,245.65, and for labor $74.884, making an aggregate of $98,129.65, all of which has been expended for current repairs of the various buildings, docks, wharves, &c. Under the head of "emergencies at naval stations" there has been expended $3,220.76. The amount expended under the head of "civil establishment" is $6,586.69, and for the various items coming under the head of "contingent" $101,384.89.

Estimates are submitted for the fiscal year ending June 30, 1875, for navy-yard, Norfolk, $85,683.77; for the following objects, viz: For repairs of all kinds; for civil establishment, navy-yard at Norfolk, Va., $12,000.

PENSACOLA, FLA.

The amount expended under the appropriation, "navy-yard, Pensacola," during the fiscal year ending 30th June, 1873, is for materials

$11,839.16, and for labor $28,364.26, making an aggregate of $40,203.42. Under the head of "emergencies at naval stations" there has been expended for materials, $8,488.21, and for labor, $3,699.08, making an aggregate of $12,187.29. The amount expended under the head of "civil establishment" is $4,459.45, and for objects coming under the head of "contingent" $42,517.47.

Estimates are submitted for the fiscal year ending 30th June, 1875, for navy-yard, Pensacola, $83,305.51, for the following objects, viz: For repairs of all kinds; for civil establishment, navy-yard, Pensacola, Fla., $6,600.

MARE ISLAND, CAL.

There has been expended at this yard during the past year, under head of "navy-yard, Mare Island," for materials $123,802.05, and for labor $222,433.36, making an aggregate of $346,235.41. The principal part of these expenditures were upon the repairs of the floating dry-dock and upon the construction of the new excavated stone dry-dock. Under the appropriation "emergencies at naval stations," there was expended the sum of $643.25. The amount expended under appropriation for "civil establishment" is $8,358.59, and for the various objects coming under "contingent" $98,029.21.

Estimates are submitted for the fiscal year ending 30th June, 1875, for navy-yard, Mare Island, $101,100, for the following objects, viz: For repairs of all kinds; for civil establishment, navy-yard at Mare Island, Cal., $10,500.

SACKETT'S HARBOR.

There having been no special appropriation for this station, the amount necessary for the preservation of the public property, amounting to $1,003.74, has been paid from the appropriation "contingent" during the past fiscal year.

Estimates are submitted for the fiscal year ending 30th June, 1875, for protection and preservation of public property, $2,000.

MOUND CITY, ILL.

There being no appropriation for improvements at this station, and certain repairs to the buildings and levee becoming indispensable, the work has been done under the appropriation "emergencies at naval stations." The amount expended is for materials $984, and for labor $476, making an aggregate of $1,460. The amount paid under head of "contingent" is $12,380.91.

Estimates are submitted for the fiscal year ending 30th June, 1875, for protection and preservation of public property, $2,000.

NEW LONDON, CONN.

The amount expended at this station, under appropriation "naval station, New London," is for materials $495.15, and for labor $19,504.85, making an aggregate of $20,000. The amount expended under the head of "contingent" is $5,922.78.

Estimates are submitted for the fiscal year ending June 30, 1875, for the protection and preservation of the public property, $10,000.

LEAGUE ISLAND, PA.

The amount expended under the appropriation, "naval station, League Island," during the fiscal year ending 30th June, 1873, is for materials $161,440.62, and for labor $24,191.77, making an aggregate of $185,632,39. Under the appropriation for "emergencies at naval stations" there has been expended $999.70. The amount expended under head of "civil establishment" is $5,800.02, and under appropriation "contingent," $41,986.65.

Estimates are submitted for the fiscal year ending 30th June, 1875, for repairs of all kinds; for civil establishment, navy-yard, League Island, Pa., $7,800.

KEY WEST, FLA.

There has been expended under the appropriation, "naval station, Key West," during the fiscal year ending 30th June, 1873, for materials $2,136.74, and for labor $13,275.12, making an aggregate of $15,411.86. These expenditures have been made upon the foundry, and repairs upon other buildings, wharves, &c. For objects coming under the head of "contingent" there has been expended $1,284.73.

Estimates are submitted for the fiscal year ending 30th June, 1875, for repairs of all kinds, $5,000.

NEW ORLEANS, LA.

There being no special appropriatian for this station, and repairs being necessary to the levee, during the past year, the sum of $210 was expended for this purpose, under the head of "emergencies." There has been expended under the head of "contingent," $53.60.

Estimates are submitted for the fiscal year ending 30th June, 1875, for repairs of all kinds, $5,000.

NAVAL ASYLUM.

On the 1st July, 1872, there were 161 persons, including officers and attendants, borne on the rolls of the asylum. During the fiscal year ending 30th June, 1873, 12 beneficiaries have been admitted, 9 have died, and 2 honorably discharged.

The expenses of the institution for the support of the beneficiaries, pay of officers and attendants, and for miscellaneous repairs, during the past fiscal year, are, viz:

For subsistence	$17,014 40¼
For clothing, tobacco, &c	11,513 38½
For miscellaneous items	10,816 28
For officers and attendants	26,151 29
	65,495 35¾

The total amount estimated for the support of the institution during the fiscal year ending 30th June, 1875, for the annual repairs of buildings, improvement of cemetery, support of beneficiaries, and pay of officers and attendants, is $69,307, which, by law, is paid out of the naval-pension fund.

EMERGENCIES AT NAVAL STATIONS.

Under this appropriation, as hereinbefore stated, there has been expended at the several navy-yards and stations, during the fiscal year ending 30th June, 1873, the sum of $27,963.12. These expenditures were made at Kittery, Charlestown, Brooklyn, Washington, Norfolk, Pensacola, Mare Island, League Island, Mound City, and New Orleans, for objects of pressing necessity, and for which no special appropriation had been made.

Estimates are submitted for the fiscal year ending 30th June, 1875, for "contingent at naval stations," which is the title given by Congress to this appropriation, for the sum of $50,000.

"GENERAL MAINTENANCE OF YARDS AND DOCKS."

The objects coming under this head were formerly estimated for under the head of "contingent," but at the last session of Congress the heading was changed to the present more appropriate one.

The amount expended at the several navy-yards and stations, under the head of "contingent," during the fiscal year ending the 30th June, 1873, is $879,528.75.

Estimates are submitted for the fiscal year ending 30th June, 1875, for necessary expenses for the same objects, but coming under the head of "general maintenance of yards and docks," amounting to $860,000.

I am, sir, very respectfully, your obedient servant,

C. R. P. RODGERS,
Chief of Bureau.

HON. GEO. M. ROBESON,
Secretary of the Navy, Washington, D. C.

ABSTRACT OF OFFERS FOR SUPPLIES (EMBRACING AS WELL THOSE WHICH ARE REJECTED AS THOSE WHICH ARE ACCEPTED) RECEIVED FOR FURNISHING ARTICLES COMING UNDER THE COGNIZANCE OF THE BUREAU OF YARDS AND DOCKS, MADE IN CONFORMITY TO THE ACT OF CONGRESS APPROVED MARCH 3, 1843.

Offers for supplies for the navy-yard at Portsmouth, N. H., under advertisement dated May 14, 1873.

Class No. 6. White pine, spruce, juniper and cypress:	
G. A. Hammond	$5,010 45
Trickey & Jewett	*4,975 10
Samuel Adams & Co	6,638 50
Class No. 7. Lime, hair, and plaster:	
Hyatt & Spencer	†215 00
D. Babcock & Co	*135 00
Jos. L. Savage	199 00
Trickey & Jewett	200 00
Samuel Adams & Co	145 00
Class No. 11. Iron, iron spikes, and nails:	
Hyatt & Spencer	†5,419 00
D. Babcock & Co	*4,262 00
Jos. L. Savage	*84,288 00
Class No. 14. Files:	
Hyatt & Spencer	†309 22
Jas. L. Parker	*333 00
Jos. L. Savage	293 90
Class No. 15. Paints, oils, and glass:	
Hyatt & Spencer	†998 65
Jas. L. Parker	*1,047 00
Wood, Sharp & Haines	†1,026 00
D. Babcock & Co	1,236 25
Jos. L. Savage	1,054 00
Class No. 18. Stationery:	
Wm. H. Dempsey	*249 75
Frost & Adams	312 44
A. S. Barnes & Co	387 32

* Accepted.

† Rejected.

Jos. H. Foster	$257 31
Wm. Ballantyne	280 65

Class No. 20. Hay and straw:

G. A. Hammond	*2,190 00
Jos. L. Savage	4,900 00
Trickey & Jewett	2,800 00

Class No. 21. Provender:

Jos. L. Savage	2,703 50
Trickey & Jewett	*2,657 50

Class No. 22. Charcoal:

Chas. G. Brown	$290 00
D. Babcock & Co	*250 00

Class No. 24. Sperm and lubricating oils:

Hyatt & Spencer	†175 00
Jas. L. Parker	167 00
D. Babcock & Co	184 00
Jos. L. Savage	*‡167 00

Offers for supplies for the navy-yard at Charlestown, Mass., under advertisement dated May 14, 1873.

Class No. 1. Bricks:

Trickey & Jewett	$2,400 00
Hugh Kelley	1,820 00
Jos. L. Savage	1,895 00
D. Babcock & Co	1,950 00
John Turner	*1,650 00

Class No. 2. Stone:

Jos. L. Savage	*137 00
D. Babcock & Co	210 00
John Turner	219 00

Class No. 5. Oak and hard-wood:

Trickey & Jewett	*950 00
Jos. W. Duryea	980 00

Class No. 6. White pine, spruce, and juniper:

Trickey & Jewett	*8,350 00
Jos. W. Duryea	8,400 00

Class No. 7. Lime, hair, and plaster:

Trickey & Jewett	350 00
S. H. Fall	290 00
Hyatt & Spencer	†400 00
Hugh Kelley	294 00
Jos. L. Savage	398 00
D. Babcock & Co	*250 00
John Turner	290 00

Class No. 8. Cement:

Trickey & Jewett	500 00
S. H. Fall	500 00
Hyatt & Spencer	†430 00
Hugh Kelley	530 00
Jos. L. Savage	400 00
D. Babcock & Co	*‡400 00
John Turner	440 00

Class No. 9. Gravel and sand:

S. H. Fall	1,430 00
Hugh Kelley	$1,405 00
D. Babcock & Co	1,400 00
John Turner	*1,275 00
Ezra Eames	1,525 00

Class No. 11. Iron, iron spikes, and nails:

Hyatt & Spencer	†1,900 50
Jos. L. Savage	1,863 40
Loring, Wales Bros	2,088 70
Geo. H. Creed	*1,705 15
D. Babcock & Co	2,173 80

Class No. 12. Steel:

Hyatt & Spencer	†267 27
Jos. L. Savage	257 92
Loring, Wales Bros	325 18
Geo. H. Creed	*243 92

Class No. 15. Painsts, oils, and glass:

Hyatt & Spencer	†1,842 16
Jos. L. Savage	1,793 90
Geo. H. Creed	*1,649 50
D. Babcock & Co	1,783 00
Wood, Sharp & Haines	1,992 75

Class No. 16. Ship-chandlery:

Hyatt & Spencer	†1,833 74
Jos. L. Savage	*1,300 65
Geo. H. Creed	1,633 42
D. Babcock & Co	1,939 14

Class No. 17. Hardware:

Hyatt & Spencer	†2,899 31
Jos. L. Savage	2,872 80
Geo. H. Creed	*2,308 90

Class No. 18. Stationery:

Frost & Adams	787 57
Wm. H. Dempsey	*601 56
Wm. Ballantyne	653 35
A. G. Barnes & Co	905 07
J. M. Whittimore	715 30

* Accepted. † Rejected. ‡ Decided by lot.

Class No. 20. Hay and straw:

Trickey & Jewett	*$4,100 00
S. H. Fall	4,175 00
John Mullett	4,151 25
Jos. L. Savage	6,525 00

Class No. 21. Provender:

Trickey & Jewett	2,985 00
John Mullett	*2,474 00
Jos. L. Savage	4,159 00

Class No. 22. Charcoal:

John Mullett	*105 00
D. Babcock & Co	125 00

Class No. 23. Belting, packing, and hose:

Hyatt & Spencer	†782 80
Joseph L. Savage	$772 90
George H. Creed	*746 40
D. Babcock & Co	923 30

Class No. 24. Sperm and lubricating oils:

Hyatt & Spencer	†360 95
John Mullett	357 75
Joseph L. Savage	358 45
George H. Creed	*325 90
D. Babcock & Co	396 55

Class No. 25. Iron-work, piping, &c.:

Hyatt & Spencer	†3,019 21
Joseph L. Savage	3,566 60
George H. Creed	*3,262 00

Offers for supplies for the navy-yard at Brooklyn, N. Y., under advertisement dated May 14, 1873.

Class No. 1. Bricks:

Joseph L. Savage	$480 00
D. Babcock & Co	*450 00
Watson & Pittinger	537 50
Hawkins & Henkens	†450 00
S. P. Brown	925 00

Class No. 3. Yellow-pine timber:

Trickey & Jewett	1,415 00
Watson & Pittinger	1,536 00
J. Bigler & Co	*1,329 00
S. P. Brown	1,857 50

Class No. 5. Oak and hardwood:

Trickey & Jewett	897 50
Watson & Pittinger	1,183 00
J. Bigler & Co	886 00
S. P. Brown	*825 00

Class No. 6. White, spruce, juniper, and cypress:

Trickey & Jewett	5,677 50
Watson & Pittinger	*4,235 00
J. Bigler & Co	5,070 00
Joseph W. Duryea	4,343 50
S. P. Brown	6,920 00

Class No. 7. Lime, hair, and plaster:

Joseph L. Savage	*137 00
D. Babcock & Co	175 00
Watson & Pittinger	205 00
Hyatt & Spencer	†198 00
Hawkins & Henkens	138 00

Class No. 8. Cement:

Joseph L. Savage	$210 00
D. Babcock & Co	*180 00
Watson & Pittinger	240 00
Hyatt & Spencer	†195 00
Hawkins & Henkens	185 00

Class No. 9. Gravel and sand:

Joseph L. Savage	224 00
D. Babcock & Co	*220 00

Class No. 11. Iron, iron spikes, and nails:

Joseph L. Savage	3,451 25
D. Babcock & Co	3,168 75
Hyatt & Spencer	†2,784 94
George H. Creed	*2,622 50

Class No. 12. Steel:

Joseph L. Savage	*222 50
Hyatt & Spencer	†226 50
George H. Creed	235 00

Class No. 14. Files:

Joseph L. Savage	*288 74
D. Babcock & Co	289 26
Hyatt & Spencer	†272 91
George H. Creed	298 70

Class No. 15. Paints, oils, and glass:

Joseph L. Savage	*2,913 00
Wood, Sharp, & Haines	3,305 35
D. Babcock & Co	3,223 12
Hyatt & Spencer	†3,126 48
George H. Creed	2,972 25

* Accepted.

† Rejected.

Class No. 16. Ship-chandlery:

Joseph L. Savage	$3,402 15
D. Babcock & Co	*3,244 41
Hyatt & Spencer	†3,259 84
George H. Creed	3,903 38

Class No. 17. Hardware:

Joseph L. Savage	1,384 50
D. Babcock & Co	1,307 79
Hyatt & Spencer	†1,314 83
George H. Creed	*1,290 05

Class No. 18. Stationery:

William H. Dempsey	*1,107 89
William Ballantyne	1,248 85
A. S. Barnes & Co	1,560 92

Class No. 20. Hay and straw:

Joseph L. Savage	4,200 00
E. R. Shipman	*3,930 00

Class No. 21. Provender:

Joseph L. Savage	4,030 00
E. R. Shipman	*$3,638 00

Class No. 22. Charcoal:

D. Babcock & Co	*120 00

Class No. 23. Belting, packing, and hose:

Joseph L. Savage	*582 25
D. Babcock & Co	729 60
Hyatt & Spencer	†566 00
George H. Creed	763 00

Class No. 24. Sperm and lubricating oils:

Joseph L. Savage	494 40
D. Babcock & Co	526 00
Hyatt & Spencer	†525 40
George H. Creed	*481 00

Class No. 25. Iron-work, piping, &c.:

Joseph L. Savage	703 00
D. Babcock & Co	575 00
Hyatt & Spencer	†541 43
George H. Creed	*524 60

Offers for supplies for the navy-yard at Philadelphia, Pa., under advertisement dated May 14, 1873.

Class No. 1. Bricks:

Paul J. Field	$184 00
Benjamin Allen	148 00
Joseph L. Savage	*130 00
D. Babcock & Co	210 00
John Sowney	145 00
D. & J. Noblet	136 00

Class No. 6. White pine, spruce, juniper, and cypress.

J. W. Gaskill & Sons	405 00
J. W. Duryea	*364 00

Class No. 9. Gravel and sand:

Paul J. Field	150 00
D. Babcock & Co	250 00
D. & J. Noblet	*62 50
J. W. Paxson & Co	135 00

Class No. 15. Paints, oils, and glass:

Wood, Sharp, & Haines	261 35
Hyatt & Spencer	†95 00
Joseph L. Savage	*88 70
D. Babcock & Co	132 65
George H. Creed	106 50
D. & J. Noblet	114 40

Class No. 16. Ship-chandlery:

Paul J. Field	674 00
Hyatt & Spencer	†$545 00
Joseph L. Savage	594 22
D. Babcock & Co	681 20
George H. Creed	632 95
E. H. Fitler & Co	*547 80
D. & J. Noblet	661 20

Class No. 17. Hardware:

Paul J. Field	174 23
Hyatt & Spencer	†150 18
Joseph L. Savage	*153 27
D. Babcock & Co	156 48
George H. Creed	208 10

Class No. 18. Stationery:

Ferdinand Foster	647 95
A. S. Barnes & Co	975 60
William Ballantyne	671 16
William H. Dempsey	*607 56

Class No. 20. Hay and straw:

Paul J. Field	1,159 20
Joseph L. Savage	1,285 00
John Sowney	*795 00

Class No. 21. Provender:

Paul J. Field	1,123 00
Joseph L. Savage	1,248 00
John Sowney	*927 50

* Accepted. † Rejected.

Offers for supplies for the naval station at League Island, Pa., under advertisement dated May 14, 1873.

Class No. 1. Bricks:

Paul J. Field	$1,790 00
Joseph L. Savage	1,700 00
Morris Ebert	*1,145 00
D. Babcock & Co	1,400 00
Benjamin Allen	1,290 00
D. & J. Noblet	1,300 00
Charles W. Sanger	1,194 00

Class No. 6. White pine, spruce, juniper, and cypress:

J. Bigler & Co	5,260 00
J. W. Gaskill & Sons	4,458 50
J. W. Duryea	*3,982 50

Class No. 8. Cement:

Joseph L. Savage	540 00
Morris Ebert	588 00
D. Babcock & Co	*504 00
Hyatt & Spencer	†480 00
D. & J. Noblet	588 00

Class No. 9. Gravel and sand:

Paul J. Field	235 00
Joseph L. Savage	195 00
D. Babcock & Co	250 00
D. & J. Noblet	*125 00
J. W. Paxson & Co	175 00

Class No. 16. Ship-chandlery:

Paul J. Field	519 40
Joseph L. Savage	*325 95
D. Babcock & Co	393 65
Hyatt & Spencer	†344 31

Class No. 18. Stationery:

William Ballantyne	384 94
A. S. Barnes & Co	640 18
William H. Dempsey	*350 11

Offers for supplies for the Naval Asylum at Philadelphia, Pa., under advertisement dated May 14, 1873.

Class No. 1. Clothing:

Jacob Reed	*$4,571 25

Class No. 2. Hats, boots, and shoes:

James Cotter & Sons	*1,168 75

Class No. 3. Provisions:

G. & A. Scheidt	*10,142 30
William P. Corney	10,456 35

Class No. 4. Groceries:

Joseph Hazzard	6,541 75
Anderson & Dunlap	*6,131 90
Thomas Scott & Co	†6,108 12
Crippen & Maddock	6,266 25

Class No. 5. Dry-goods:

Crippen & Maddock	*957 00

Class No. 6. Bread, &c.:

Charles McIntyre	*1,815 00
John McIlwain	1,830 00
Thomas McConnell	1,830 75

Class No. 7. Tobacco:

Paul J. Field	*980 00
Crippen & Maddock	‡970 00
John Baird	970 00

Class No. 8. Coal:

Crippen & Maddock	$2,710 00
Plaisted & McCollin	2,564 62
William F. Moody	*2,497 50

Class No. 9. Paints, oils, and glass:

Wood, Sharp & Haines	*148 15
D. & J. Noblet	177 83
Crippen & Maddock	241 00

Class No. 11. Lumber:

Crippen & Maddock	*350 50

Class No. 13. Provender:

Paul J. Field	297 00
John Sowney	*259 75
Crippen & Maddock	315 00

Class No. 14. Miscellaneous:

Paul J. Field	286 75
Hyatt & Spencer	†210 83
Crippen & Maddock	*286 40

Class No. 15. Hardware:

Paul J. Field	*166 05
Hyatt & Spencer	†165 45
Crippen & Maddock	451 40

Class No. 16. Stationery:

William H. Dempsey	*155 50
William Ballantyne	179 40

* Accepted † Rejected. ‡ Decided by lot.

Offers for supplies for the navy-yard at Washington, D. C., under advertisement dated May 14, 1873.

Class No. 1. Bricks:	
Herrill & Childs	$1,400 00
S. P. Brown	*1,240 00
William Guinand	1,400 00
D. Babcock & Co	1,570 00
Joseph L. Savage	1,400 00
Class No. 2. Stone:	
S. P. Brown	1,110 00
D. Babcock & Co	900 00
Joseph L. Savage	*585 00
Class No. 5. Oak and hard-wood:	
Jos. W. Duryea	1,345 00
T. Edward Clark & Co.	1,410 00
Watson & Pittinger	1,830 00
J. W. Gaskill & Sons	*1,210 00
S. P. Brown	1,469 50
Class No. 6. White pine, spruce, juniper, and cypress:	
Joseph W. Duryea	*1,355 00
T. Edward Clark & Co.	1,600 00
Watson & Pittinger	1,500 00
J. W. Gaskill & Sons	1,502 00
S. P. Brown	1,640 00
Class No. 9. Gravel and sand:	
William Guinand	150 00
D. Babcock & Co	170 00
Jos. L. Savage	*110 00
Class No. 11. Iron, iron spikes, and nails:	
George H. Creed	*876 00
Hyatt & Spencer	893 25
Joseph L. Savage	930 00
Class No. 12. Steel:	
George H. Creed	353 60
Hyatt & Spencer	†$419 90
Joseph L. Savage	†319 50
Class No. 15. Paints, oils, and glass:	
George H. Creed	1,045 50
Hyatt & Spencer	†1,050 80
Wood, Sharp & Haines	1,173 50
H. C. H. Webster	1,103 23
D. Babcock & Co	*1,027 10½
Joseph L. Savage	1,077 90
Class No. 16. Ship-chandlery:	
George H. Creed	614 35
Hyatt & Spencer	†506 78
D. Babcock & Co	542 25
Joseph L. Savage	*478 50
Class No. 17. Hardware:	
George H. Creed	278 15
Hyatt & Spencer	†244 64
Joseph L. Savage	*178 80
Class No. 18. Stationery:	
A. S. Barnes & Co	732 82
William Ballantyne	575 47½
William H. Dempsey	*564 75
Class No. 20. Hay and straw:	
George M. Beall	1,304 36
F. W. Classen	1,540 00
Solon, Fisher & Co	1,288 00
William Guinand	1,432 00
Joseph L. Savage	1,300 00
Mary H. Dorsey	*1,207 00
Class No. 21. Provender:	
George M. Beall	933 00
F. W. Classen	1,164 00
Beall & Shoemaker	1,002 00
Solon, Fisher & Co	874 00
William Guinand	1,128 00
Joseph L. Savage	*858 00
Mary Dorsey	914 00

Offers for supplies for the navy-yard at Norfolk, Va., under advertisement dated May 14, 1873.

Class No. 1. Bricks:	
Joseph L. Savage	$1,500 00
J. P. Moore	*1,448 00
A. A. McCullough	1,720 00
A. H. Lindsay	1,700 00
H. V. Neimeyer	1,645 00
D. Babcock & Co	1,600 00
Class No. 4. Yellow-pine lumber:	
A. A. McCullough	*$732 00
Lookins & Myers	859 00
Watson & Pittinger	1,092 00
A. H. Lindsay	1,095 00
H. V. Neimeyer	852 00
J. W. Gaskill & Sons	1,232 50

* Accepted. † Rejected.

Class No. 5. Oak and hardwood:

A. A. McCullough	*$79 20
Watson & Pittinger	382 00
Joseph W. Duryea	184 80

Class No. 6. White pine, spruce, juniper, and cypress:

A. A. McCullough	*1,406 00
Watson & Pittinger	1,604 00
Joseph W. Duryea	1,494 50
J. W. Gaskill & Sons	1,828 50

Class No. 7. Lime, hair, and plaster:

Joseph L. Savage	253 50
A. A. McCullough	*225 00
Lookins & Myers	337 50
Hyatt & Spencer	†300 00
F. W. Classen	322 50
H. V. Neimeyer	258 75
Peters Brothers	255 00
D. Babcock & Co	270 00

Class No. 8. Cement:

Joseph L. Savage	964 00
J. P. Moore	962 00
A. A. McCullough	1,140 00
Hyatt & Spencer	†795 00
F. W. Classen	1,156 00
H. V. Neimeyer	*944 00
George F. Gephart, sec'ty	†400 00
D. Babcock & Co	1,020 00

Class No. 10. Slate:

Joseph L. Savage	825 00
A. A. McCullough	*750 00
Lookins & Myers	1,050 00
Hyatt & Spencer	†870 00
H. V. Neimeyer	870 00
D. Babcock & Co	810 00

Class No. 11. Iron, iron spikes, and nails:

Joseph L. Savage	1,774 16
J. P. Moore	*1,574 05
Hyatt & Spencer	†1,551 12
George H. Creed	1,723 00

Class No. 14. Files:

Joseph L. Savage	198 90
J. P. Moore	*191 95
Hyatt & Spencer	†180 40
George H. Creed	245 00
R. H. Howard & Co	201 05
D. Babcock & Co	211 46

Class No. 15. Paints, oils, and glass:

Jos. L. Savage	983 00
Wood, Sharp & Haines	†$704 10
Hyatt & Spencer	†643 69
Westner, Sheive & Willey	986 50
George H. Creed	770 75
Wilson & Brother	*721 35
D. Babcock & Co	786 75

Class No. 16. Ship-chandlery:

Joseph L. Savage	516 30
Lookins & Myers	605 70
Hyatt & Spencer	†437 37
George H. Creed	*477 10
D. Babcock & Co	640 85

Class No. 17. Hardware:

Joseph L. Savage	*1,699 41
J. P. Moore	1,764 80
Hyatt & Spencer	†1,615 29
George H. Creed	2,099 57

Class No. 18. Stationery:

William Ballantyne	323 09
William H. Dempsey	*307 24
A. S. Barnes & Co	417 95

Class No. 20. Hay and straw:

Joseph L. Savage	3,785 00
A. A. McCullough	*2,211 25
Lookins & Myers	2,845 00
F. W. Classen	3,305 00
A. H. Lindsay	2,545 00
H. V. Neimeyer	2,600 00
Peters Brothers	2,640 00
R. C. Culpepper & Bro	3,570 00

Class No. 21. Provender:

Jos. L. Savage	2,141 25
A. A. McCullough	1,862 75
Lookins & Myers	2,265 00
F. W. Classen	2,525 00
A. H. Lindsay	1,852 75
H. V. Neimeyer	2,090 00
Peters Brothers	*1,786 00
R. McGregor, Treas	3,081 25
R. C. Culpepper & Bro	1,897 75

Class No. 23. Belting, packing, and hose:

Jos. L. Savage	309 00
J. P. Moore	268 85
Lookins & Myers	*194 00
Hyatt & Spencer	†244 20
Geo. H. Creed	280 00
D. Babcock & Co	290 00

Class No. 24. Sperm and lubricating oils:

Jos. L. Savage	*297 44
Hyatt & Spencer	†297 44
Geo. H. Creed	325 60
Wilson & Brother	330 88
D. Babcock & Co	308 00

* Accepted.

† Rejected.

Class No. 25. Iron-work, piping, &c.:

Jos. L. Savage	*$40 00
J. P. Moore	44 70
Hyatt & Spencer	58 48

Class No. 31. Copper and composition nails:

Jos. L. Savage	$446 00
J. P. Moore	464 00
Hyatt & Spencer	†441 20
Geo. H. Creed	*435 00

Offers for supplies for the navy-yard at Pensacola, Fla., under advertisement dated May 14, 1873.

Class No. 1. Bricks:

Jos. L. Savage	$1,100 00
Lookins & Myers	2,250 00
Geo. Pfieffer	*862 50
M. G. Jinestea	890 00

Class No. 4. Yellow-pine lumber:

J. O. Neal	*1,499 00
A. J. Parlin	3,109 00
Geo. H. O'Neal	1,741 50
R. E. Anson	1,605 00

Class No. 6. White pine, juniper, spruce, and cypress:

J. O'Neal	869 00
J. W. Duryea	*490 00
J. D. Kenney	654 00
D. Babcock & Co	630 00

Class No. 7. Lime, hair, and plaster:

Jos. L. Savage	275 00
J. O. Neal	230 00
Geo. Pfieffer	224 00
J. D. Kenney	*220 00
D. Babcock & Co.	240 00

Class No. 10. Slate:

Jos. L. Savage	1,950 00

Class No. 11. Iron, iron spikes, and nails:

Jos. L. Savage	227 50
J. O. Neal	238 75
J. D. Kenney	*212 50
Hyatt & Spencer	†350 00
D. Babcock & Co	230 00

Class No. 18. Stationery:

John A. Walker	801 92
Wm. H. Dempsey	*707 89
Wm. Ballantyne	723 85

Class No. 20. Hay and straw:

Jos. L. Savage	1,200 00
J. O. Neal	960 00
Thos. C. Quayle	*940 00

Class No. 21. Provender:

Jos. L. Savage	930 00
J. O. Neal	*876 00
Thos. C. Quayle	895 50

Offers for supplies for the navy-yard at Mare Island, Cal., under advertisement dated May 14, 1873.

Class No. 1. Bricks:

A. Powell	*‡$1,500 00
J. D. Piper	1,527 00
N. P. Perine	1,500 00

Class No. 2. Stone:

S. P. Brown	*60,075 00
Oliver Taylor	130,500 00
Griffith, Myers & McCormick	80,100 00
Robt. Stearns	91,800 00

Class No. 3. Yellow-pine timber:

J. E. de la Montagine	*34,469 48
A. Powell	34,754 68
F. M. Brown & Co	39,216 40
A. D. & J. P. Moore	$60,067 60
Seth. H. Wetherbee	38,014 50
John P. Sheldon	45,050 70
John Kentfield & Co	34,545 56
Geo. McMullin	43,460 46
G. A. Meigs	†32,286 29

Class No. 4. Yellow-pine lumber:

J. E. de la Montagine	*1,600 00
A. Powell	2,000 00
F. M. Brown & Co	4,320 00
A. D. & J. P. Moore	2,877 00
S. H. Wetherbee	1,954 00
John Sheldon	2,400 00
John Kentfield & Co	1,915 98
Geo. McMullin	2,080 00
G. A. Meigs	1,720 00

* Accepted. † Rejected. ‡ Decided by lot.

Class No. 5. Oak and hard-wood:

J. E. de la Montagine	*$10,450	00
A. Powell	10,710	00
F. M. Brown	11,752	50
Seth H. Wetherbee	12,169	50
J. Bigler & Co	10,502	50

Class No. 6. White pine spruce, juniper, and cypress:

J. E. de la Montagine	*1,388	00
A. Powell	1,541	00
F. M. Brown & Co	2,992	00
A. D. & J. P. Moore	1,637	50
Seth H. Wetherbee	1,665	00
John P. Sheldon	2,295	00
John Kentfield & Co	1,639	05

Class No. 7. Lime, hair, and plaster:

Hanscom & Farwell	6,047	50
A. Powell	5,186	50
Davis & Cowell	*5,125	00
H. T. Holmes	5,125	00

Class No. 8. Cement:

Hanscom & Farwell	14,600	00
A. Powell	15,512	50
S. P. Brown	21,827	00
Kittle & Co	12,738	50
F. B. Taylor	14,454	00
H. P. Delafield, sec'y	13,413	75
Davis & Cowell	14,600	00
H. T. Holmes	14,600	00
D. Babcock & Co	*13,395	50

Class No. 9. Gravel and sand:

Hanscom & Farwell	10,960	00
A. Powell	*4,750	00
J. D. Piper	6,345	00
N. P. Perine	8,500	00

Class No. 11. Iron, iron spikes, and nails:

Hanscom & Farwell	5,509	00
VanWinkle & Davenport	5,570	50
Linforth, Kellogg & Co	4,991	00
D. Babcock & Co	*4,865	00
Hooker & Co	5,202	00

Class No. 12. Steel:

Hanscom & Farwell	744	00
VanWinkle & Davenport	*$683	00
D. Babcock & Co	696	00
Hooker & Co	†614	00

Class No, 14. Files:

Hanscom & Farwell	397	27
VanWinkle & Davenport	557	93
Hyatt & Spencer	†292	33
D. Babcock & Co	*345	31
Pillsbury, Webb & Co	384	29
Hooker & Co	373	61

Class No. 15. Paints, oils, and glass:

Hanscom & Farwell	1,449	95
A. C. Deitz & Co	†906	90
F. B. Taylor	1,168	85
Whittier, Fuller & Co	1,156	70
D. Babcock & Co	*1,149	50

Class No. 16. Ship-chandlery:

Hanscom & Farwell	5,928	83
D. Babcock & Co	*5,886	99

Class No. 17. Hardware:

Hanscom & Farwell	2,694	32
D. Babcock & Co	*2,651	19
Pillsbury, Webb & Co	†2,304	10
Hooker & Co	†2,423	76

Class No. 18. Stationery:

Wm. Ballantyne	1,287	43
Wm. H. Dempsey	†497	97
L. H. Bonestell	*1,054	33

Class No. 21. Provender:

A. Powell	*1,605	00
Jos. Bassett	1,632	50

Class No. 24. Sperm and lubricating oils:

Hanscom & Farwell	1,200	00
F. B. Taylor	*1,170	00
Whittier, Fuller & Co	1,350	00
D. Babcock & Co	1,188	00

Class No. 25. Iron-work, piping, &c.:

Hanscom & Farwell	*782	00
VanWinkle & Davenport	813	75
D. Babcock & Co	859	70

*Accepted.

†Rejected.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1875, by the Bureau of Yards and Docks, Navy Department.

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
SALARIES.		
Chief clerk, per act of July 5, 1862, (12 Stat. at L., p. 511, sec. 3)	$1,800 00	
Draughtsman, per act of Mar. 2, 1867, (14 Stat. at L., p. 450, sec. 1)	1,800 00	
One clerk of class four, per act of Mar. 2, 1867, (14 Stat. at L., p. 450, sec. 1)	1,800 00	
Two clerks of class three, per act of Mar. 2, 1867, (14 Stat. at L., p. 450, sec. 1)	3,200 00	
One clerk of class two, per act of Mar. 2, 1867, (14 Stat. at L., p. 450, sec. 1)	1,400 00	
One clerk of class one, per act of Mar. 2, 1867, (14 Stat. at L., p. 450, sec. 1)	1,200 00	
One messenger, per act of July 5, 1862, (12 Stat. at L., p. 511, sec. 3,) and July 12, 1870, (16 Stat. at L., p. 250, sec. 3)	840 00	
Two laborers, at $720 each, (same acts)	1,440 00	
	13,480 00	$15,760 00
CONTINGENT EXPENSES.		
Stationery, books, plans, drawings, incidental labor, and miscellaneous items, (appropriated, 17 Stat. at L., p. 501)	1,800 00	800 00
Public printing and binding, (submitted)	8,000 00	
Postage-stamps, (submitted)	2,000 00	
NAVAL ASYLUM, PHILADELPHIA.		
Superintendent, (appropriated, 17 Stat. at L., p. 551)	$600 00	
Steward, (appropriated, 17 Stat. at L., p. 551)	480 00	
Matron, (appropriated, 17 Stat. at L., p. 551)	360 00	
Cook, (appropriated, 17 Stat. at L., p. 551)	240 00	
First assistant cook, (appropriated, 17 Stat. at L., p. 551)	168 00	
Second assistant cook, (appropriated, 17 Stat. at L., p. 551)	144 00	
Chief laundress, (appropriated, 17 Stat. at L., p. 551)	192 00	
Three laundresses, $168 each, (appropriated, 17 Stat. at L., p. 551)	504 00	
Eight scrubbers and waiters, $168 each, (appropriated, 17 Stat. at L., p. 551)	1,344 00	
Six laborers, $240 each, (appropriated, 17 Stat. at L., p. 551)	1,440 00	
Stable-keeper and driver, (appropriated, 17 Stat. at L., p. 551)	360 00	
Master-at-arms, (appropriated, 17 Stat. at L., p. 551)	720 00	
Corporal, (appropriated, 17 Stat. at L., p. 551)	300 00	
Barber, (appropriated, 17 Stat. at L., p. 551)	360 00	
Carpenter, (appropriated, 17 Stat. at L., p. 551)	845 00	
	8,057 00	
Furnaces, grates, and ranges, (appropriated, 17 Stat. at L., p. 551)	600 00	
Increasing library, postage-stamps, and car-tickets, (appropriated, 17 Stat. at L., p. 551)	300 00	
Repairs of all kinds, (appropriated, 17 Stat. at L., p. 551)	15,350 00	
Support of beneficiaries, (appropriated, 17 Stat. at L., p. 551)	45,000 00	
	61,250 00	
	69,307 00	58,478 00

NOTE.—The expenses of the Naval Asylum to be paid from income of the Navy pension-fund, in compliance with provisions of act of March 1, 1869, (15 Stat. at L., p. 277.)

CIVIL ESTABLISHMENT.		
At the navy-yard, Kittery, Me.:		
Draughtsman and clerk to civil engineer, $1,500 each, (appropriated, 17 Stat. at L., p. 550)	$3,000 00	
Time-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00	
Store-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00	
Bill-clerk to commandant's office, (appropriated, 17 Stat. at L., p. 550)	1,500 00	
Gate-keeper and detective, (appropriated, 17 Stat. at L., p. 550)	1,000 00	
Messenger to commandant's office, (appropriated, 17 Stat. at L., p. 550)	600 00	
	9,100 00	4,400 00
At the navy-yard, Charlestown, Mass.:		
Assistant civil-engineer, (appropriated, 17 Stat. at L., p. 550)	1,800 00	
Draughtsman and clerk to civil engineer, $1,500 each, (appropriated, 17 Stat. at L., p. 550)	3,000 00	
Time-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00	

Estimate of appropriations required for the service of the fiscal year, &c.—Continued.

Detailed objects of expenditure and explanations.		Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
CIVIL ESTABLISHMENT—Continued.			
Store-clerk, (appropriated, 17 Stat. at L., p. 550)	$1,500 00		
Writer to commandant, (appropriated, 17 Stat. at L., p. 550)	1,000 00		
Bill-clerk for commandant's office, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Gate-keeper and detective, (appropriated, 17 Stat. at L., p. 550)	1,000 00		
Messenger to commandant's office, (appropriated, 17 Stat. at L., p. 550)	600 00		
		$11,900 00	$6,900 00
At the navy-yard, Brooklyn, N. Y.:			
Assistant civil engineer, (appropriated, 17 Stat. at L., p. 550)	1,800 00		
Draughtsman and clerk to civil engineer, $1,500 each, (appropriated, 17 Stat. at L., p. 550)	3,000 00		
Time-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Store-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Writer to commandant, (appropriated, 17 Stat. at L., p. 550)	1,000 00		
Bill-clerk for commandant's office, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Gate-keeper and detective, (appropriated, 17 Stat. at L., p. 550)	1,000 00		
Mail-messenger, (appropriated, 17 Stat. at L., p. 550)	900 00		
Messenger to commandant's office, (appropriated, 17 Stat. at L., p. 550)	600 00		
		12,800 00	7,800 00
At the navy-yard, Philadelphia, Pa:			
Assistant civil engineer, in charge, (appropriated, 17 Stat. at L., p. 550)	$2,000 00		
Draughtsman and clerk to civil engineer, $1,500 each, (appropriated, 17 Stat. at L., p. 550)	3,000 00		
Time-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Store-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Bill-clerk for commandant's office, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Gate-keeper and detective, (appropriated, 17 Stat. at L., p. 550)	1,000 00		
Messenger to commandant's office, (appropriated, 17 Stat. at L., p. 550)	600 00		
		11,100 00	4,400 00
At the navy-yard, Washington, D. C.:			
Draughtsman and clerk to civil engineer, $1,500 each, (appropriated, 17 Stat. at L., p. 550)	3,000 00		
Time-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Store-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Bill-clerk for commandant's office, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Gate-keeper and detective, (appropriated, 17 Stat. at L., p. 550)	1,000 00		
Mail-messenger, (appropriated, 17 Stat. at L., p. 550)	1,000 00		
Messenger to commandant's office, (appropriated, 17 Stat. at L., p. 550)	600 00		
		10,100 00	5,400 00
At the navy-yard, Norfolk, Va.:			
Superintendent of yard improvements, (appropriated, 17 Stat. at L., p. 550)	2,000 00		
Draughtsman and clerk to civil engineer, $1,500 each, (appropriated, 17 Stat. at L., p. 550)	3,000 00		
Time-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Store-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Bill-clerk for commandant's office, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Gate-keeper and detective, (appropriated, 17 Stat. at L., p. 550)	1,000 00		
Mail-messenger, (appropriated, 17 Stat. at L., p. 550)	900 00		
Messenger to commandant's office, (appropriated, 17 Stat. at L., p. 550)	600 00		
		12,000 00	4,400 00
At the navy-yard, Pensacola, Fla.:			
Superintendent of yard improvements, (appropriated, 17 Stat. at L., p. 550)	2,000 00		
Time-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Store-clerk, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Gate-keeper and detective, (appropriated, 17 Stat. at L., p. 550)	1,000 00		
Messenger to commandant's office, (appropriated, 17 Stat. at L., p. 550)	600 00		
		6,600 00	3,600 00

Estimates of appropriations required for the service of the fiscal year, &c.—Continued.

Detailed objects of expenditure and explanations.		Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
At the navy-yard, Mare Island, Cal.:			
Assistant civil engineer and draughtsman, (appropriated, 17 Stat. at L., p. 550)	$2,000 00		
Clerk to civil engineer, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Time-clerk, (appropriated, 17 Stat. at L., p. 550)	1,875 00		
Store-clerk, (appropriated, 17 Stat. at L., p. 550)	1,875 00		
Bill-clerk for commandant's office, (appropriated, 17 Stat. at L., p. 550)	1,500 00		
Gate-keeper and detective, (appropriated, 17 Stat. at L., p. 550)	1,000 00		
Messenger to commandant's office, (appropriated, 17 Stat. at L., p. 550)	750 00		
		$10,500 00	$5,050 00
At the naval station, League Island, Pa.:			
Assistant civil engineer, (appropriated, 17 Stat. at L., p. 551)	1,800 00		
Draughtsman and clerk to civil engineer, $1,500 each, (appropriated, 17 Stat at L., p. 551)	3,000 00		
Time-clerk, (appropriated, 17 Stat. at L., p. 551)	1,500 00		
Store-clerk, (appropriated, 17 Stat. at L., p. 551)	1,500 00		
		7,800 00	2,800 00
FOR GENERAL MAINTENANCE OF YARDS AND DOCKS.			
For general maintenance of yards and docks; freights and transportation of materials and stores; printing, stationery, and advertising, including the commandant's office; books, maps, models, and drawings; purchase and repair of fire-engines; machinery and patent-rights to use the same; repairs of steam-engines and attendance on the same; purchase and maintenance of oxen, horses, and driving teams; carts and timber-wheels for navy-yard purposes; tools and repairs of the same; postage on letters and other mailable matter on public service, and telegrams; furniture for Government houses and offices in navy-yards; coal and other fuel; candles, oil, and gas; cleaning and clearing up yards, and care of public buildings, attendance on fires, lights, fire-engines, and apparatus; incidental labor at navy-yards; water-tax; tolls and ferriages; pay of watchmen in navy-yards; flags, awnings, and packing-boxes for Bureau of Yards and Docks purposes; (appropriated, 17 Stat. at L., p. 551)		860,000 00	860,000 00
CONTINGENT.			
For contingent expenses that may arise at navy-yards and stations; (appropriated, 17 Stat. at L., p. 551)		50,000 00	40,000 00
Navy-yard, Portsmouth, N. H., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		103,000 00	93,500 00
Navy-yard, Boston, Mass., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		137,500 00	125,000 00
Navy-yard, Brooklyn, N. Y., repairs of all kinds to peserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		152,000 00	125,000 00
Navy-yard, Philadelphia, Pa., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		78,000 00	40,000 00
Navy-yard, Washington, D. C., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		100,000 00	75,000 00
Navy-yard, Norfolk, Va., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		85,683 77	75,000 00
Navy-yard, Pensacola, Fla., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		83,305 51	25,000 00
Navy-yard, Mare Island, Cal., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		101,100 00	97,760 00
Naval station, Sackett's Harbor, N. Y., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		2,000 00	.....
Naval station, Mound City, Ill., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		2,000 00	.....
Naval station, New London, Conn., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		10,000 00	5,000 00
Naval station, Key West, Fla., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		5,000 00	5,000 00
Naval station, New Orleans, La., repairs of all kinds to preserve navy-yard; (appropriated, 17 Stat. at L., p. 368)		5,000 00	.....
		864,589 28	.....

No. 5.

BUREAU OF NAVIGATION.

NAVY DEPARTMENT,
Bureau of Navigation, October 25, 1873.

SIR: I have the honor to submit the following report of the Bureau of Navigation for the past year, together with estimates for its support, and for the expenditures that will probably be required in that division of the naval service committed to its immediate charge, for the fiscal year ending June 30, 1875. Included in this report, and transmitted herewith, are the reports and estimates of the several officers under its cognizance.

NAVIGATION.

The Laurent octant, of which mention was made in my previous report as having been deemed worthy of trial, has been found sufficiently useful in night observations to warrant its being supplied to all our sea-going ships-of-war.

The errors of the compass, due to a ship's iron, have been found of sufficient importance, even on board our wooden ships, to receive special attention in the Navy for some time past; but when the ship, in addition to the iron carried in her machinery and equipment, is iron-built, the importance of this subject becomes specially manifest. In reality, the adaptation and treatment of the marine compass on board all our modern ships, whether of the Navy or of the merchant-service; the means for most readily finding the compass-errors, and of applying correctors whenever deemed expedient; and the study of the ship's magnetic characteristics, with the practical inferences deducible therefrom, are questions which had assumed so great importance within a comparatively brief period as to appear to justify, during the past year, bringing the matter to your notice in a special communication, and in recommending that a suitable officer of the Navy be placed in immediate charge of this duty under the supervision of the Bureau. You responded favorably to these suggestions, and detailed Professor B. F. Greene, of the Navy, as superintendent of compasses. Professor Greene, who has been occupied with this work since the 1st of April last, submits a first report of his operations, appended hereto, to which I ask your attention.

HYDROGRAPHY.

Since my last report a considerable extension has been given to hydrographic work in various directions.

The Wyoming, commanded by Commander F. H. Baker, has made a very good running survey of the east coast of Mexico, from the Rio Grande to the mouth of the Coatzacoalcos.

Other vessels have executed partial surveys in the West Indies, and others again on the east coast of South America.

The Portsmouth, commanded by Commander J. S. Skerrett, is now upon her field in the North Pacific Ocean, and has examined all the supposed possible dangers lying between the Sandwich Islands and our west coast. This vessel is now employed to the westward of those islands.

The Narragansett, commanded by Commander George Dewey, has

made a good running survey from San Diego to Cape Corrientes, and is now at work within the Gulf of California, upon the completion of which survey she will join the Portsmouth.

All the results of these surveys, when received, are verified at the Hydrographic Office, prepared for publication, and published as rapidly as practicable. A liberal yearly appropriation is necessary to keep this work in progress, and is demanded by every consideration of public interest.

Besides these general surveys, much miscellaneous work is now being done, in special surveys of islands, harbors, and portions of coast-lines, within the limits of the several foreign naval stations, and in ascertaining the positions of reported dangers, or in disproving their existence.

A resolution of Congress, authorizing the employment of a vessel-of-war in making deep-sea soundings in the Pacific Ocean, caused the Department to detail the Tuscarora, commanded by Commander George E. Belknap, for that purpose. Excellent results are being obtained; and, although the season of the year has been unfavorable, soundings of great accuracy appear to have been taken for a distance of one thousand miles, from Puget Sound towards the Aleutian island of Atcha, gradually increasing depths to three statute miles.

The Fortune is being fitted, and is designed to proceed to the West Indies, for the determination of longitudes by means of the telegraphic lines now established, and for other observations in that region, to render the navigation of those waters less dangerous.

The surveys for an interoceanic ship-canal by the Napipi route have been continued to the Pacific during this year, with marked advantage, via the Doguado, one of the streams which form the Napipi. It is supposed that this survey completes the examination of all the water-sheds between Panama and the region lying south and east of that point, embracing all the lines, in fact, that gave promise of a favorable result.

The surveys via Lake Nicaragua for the same object have also been completed, and are, like the other surveys, in a high degree satisfactory.

It is perhaps advisable to advert to the general plan pursued in both surveys, in order to establish the fact that no other lines are as favorable for the construction of a ship-canal, within the limits designated, as those that are indicated. This plan has been to examine, locate geographically, and level up all the water-courses of both coasts, until having arrived at such altitudes and such distances apart of the several water-sheds of the two oceans as would settle the question of practicability of the points examined relatively to those which have been thoroughly surveyed.

The work on these surveys has been extremely laborious, tasking the highest qualities of the officers and men employed; and it is gratifying to this Bureau at their close to call officially to your notice the great merits of Commanders T. O. Selfridge and Edward P. Lull, the officers in charge of these two surveys, and the junior officers, who worked with great zeal and intelligence.

In connection with these surveys, it is proper to add that, on the east coast, the Kansas, Commander Allen V. Reed, was employed in aiding the survey under Commander E. P. Lull, and on the Pacific side, the Tuscarora, commanded by Commander George E. Belknap, aided the party under Commander T. O. Selfridge, furnishing a base of supplies, and men to assist in the field and execute the necessary hydrographic work.

The appended report of the Hydrographer gives special information in relation to the several subjects connected with the publication of

charts, sailing-directions in various parts of the world, corrected light-house lists, and tide-tables. A careful examination of it will show how actively the Hydrographic Office has been employed, and how useful it will be to our commerce, as its publications become more numerous.

In connection with this Office it may be well to state that the appropriations asked for are, in part, rather apparent than real, considered as a tax upon the Treasury, since all the moneys received from the sale of charts and other hydrographic publications revert to the Treasury.

I beg leave again to invite your attention to the increasing necessity of a more suitable building for the Hydrographic Office than the one now occupied. Aside from the insufficiency of room in the present building, there is constant danger of losing by fire the very valuable original data already collected, and steadily increasing, which could not be replaced in case of accident but by the same labor and expense through which they were obtained.

NAVAL OBSERVATORY.

By the report of the Superintendent of the Naval Observatory, it will be seen that there has been no cessation in the efforts of the superintendent and other officers to increase its usefulness and maintain its position. The appendices of the late volumes fill up the gaps of hitherto unreduced and unpublished observations in years past, and bring up the work of the Observatory nearly to date. The officers of the Observatory, with commendable zeal, have, in addition to their routine work, devoted much time to the details of the preparation for the observations of the approaching transit of Venus; some of their number forming the majority of the commission authorized by Congress for that purpose. The preparatory work for making the observations is, in fact, well-nigh complete.

The large dome of the great equatorial telescope is completed, and ready for the instrument, which will probably be mounted during the month of October, thus supplying one of the greatest wants of the Observatory, and making it an institution deserving the continued fostering care of the Department.

NAUTICAL ALMANAC.

The report of the Superintendent of the Nautical Almanac sets forth the progress of the work under his charge.

It will be seen that the larger Ephemeris, which includes that computed for the meridian of Washington, meets with an increasing demand from all parts of the United States. More than 1,400 copies have been required for sale and distribution during the past year. Of the part for navigators, comprising that computed for the meridian of Greenwich, more than 4,000 copies have been sold.

The Nautical Almanac is now well up to more than three years in advance of date of publication.

NAVY-SIGNALS.

The International Signal-Code, of which mention was made in my report of last year as being in course of publication by this Bureau, has been stereotyped, and a limited edition printed, which is now in the hands of the binder. These books, after supplying the Navy with a sufficient number of copies for its own use, will be placed on sale in the

principal nautical stores of the maritime ports for the use of such of our merchantmen as may desire to have the code at the mere cost of paper, printing, and binding. It is to be hoped that the masters of our merchant-ships will provide themselves with copies of this book, and with the necessary signal-flags, to enable them to hold communication, not only with the Navy and coast-stations of the United States, but, in time of need, with the ships and signal-stations of other maritime countries.

A new tactical signal-book for the Navy has been prepared, and is now ready for publication, requiring no distinctive flag for its use. As soon as practicable another signal-book for general service will be prepared to replace that now in use. In connection with this subject, it may be added that a key has been arranged for use, whenever desired, which will render the acquisition of our signal-books of no value to an enemy if it should ever fall into his hands.

The Army-signal method, admirable as it is for communicating with one or more parties in front, is of doubtful value in naval tactics, since it will often require to be read properly when seen from all quarters at the same time. In view of this, experiments are in progress for the use of chronosemic signals. The flash system, also, is under investigation. In the mean time the use of the Coston night-signals and of the day-flags will be regarded as in general sufficient for tactical purposes, employing the Army method as usual whenever specially available.

I am, sir, very respectfully, your obedient servant,

DANIEL AMMEN,
Chief of Bureau of Navigation.

Hon. GEO. M. ROBESON,
Secretary of the Navy.

OFFICE OF THE SUPERINTENDENT OF COMPASSES,
BUREAU OF NAVIGATION, NAVY DEPARTMENT,
Washington, October 31, 1873.

SIR: In obedience to the order of the honorable Secretary of the Navy, I reported to you, on the 28th of March last, as Superintendent of Compasses; and, among the general instructions which I thereupon received was one directing me to "submit a report, at least once a year, of the general results of my operations." In conformity with this instruction I beg now to submit the following statement concerning the work committed to my hands since the date above mentioned.

It may be proper to mention, that certain unfinished duty, which had been previously assigned to me in connection with the editorial supervision of the first official edition of the International Signal Code, has necessarily occupied some of the time which would otherwise have been devoted to my regular duties.

THE NAVY COMPASSES—RECENT IMPROVEMENTS.

As already known, through the annual reports of the Bureau of Navigation, the Liquid Compass, as made by Messrs. E. S. Ritchie & Sons,* of Brookline, Mass., near Boston, has been in course of gradual intro-

* It should be said, in explanation of this apparent partiality for the productions o a single private work-shop, that the Messrs. Ritchie are not only the original patentees, but the sole makers, of these compasses.

duction by the Bureau into the Navy for a number of years past, till, at length, under the several forms of Azimuth, Steering, Tell-tale, and Boat-compass, it has come to be exclusively used on board all United States ships of war. And I believe the conviction is quite well established among officers of the Navy, as the result of experience, essentially tentative from the beginning, that this compass, in its fundamental features of a bouyant card in a liquid medium, with a pressure at the pivot, upward or downward, entirely at control, is not only sound in principle, but convenient and reliable in use. In my opinion it satisfies the three fundamental desiderata of a marine compass, by admitting—(1) of sufficient magnetic power, (2) of great stability or steadiness, and (3) of extreme sensibility. As supplied to the Navy for several years past I am fully satisfied that, in stability and sensibility, even with much rough service, it leaves little to be desired. In regard to magnetic power, although, as tried by experience, it appears quite satisfactory, in both intensity and permanency, still I think it admits of being improved in both particulars.

But, while appreciating very highly the intelligent and careful workmanship bestowed upon the construction of the Navy compasses, I have for some time believed that they admitted of improvement in certain details, which would enhance their value for some requirements of their use in modern navigation. I allude more particularly to the general details of the card, and especially to the construction of the card circle; having believed that it admits of a higher degree of precision in its construction and adjustment upon the card.

Relative to the question of compass improvement, it may of course be admitted that, in certain features of its construction, and under the trying circumstances of its use on board ship, the marine compass is hardly to be regarded as belonging to the class of "instruments of precision." But, although an accuracy of an eighth or even of a quarter of a point may be deemed sufficient for ordinary steering in an open sea, it would seem that this, as an error incident to the observation of a course, should not be too greatly complicated by unknown errors of the instrument itself; inasmuch as we have no certainty as to the limit of the total errors, while the aggregate may prove to be quite serious. Besides, it is believed that the modern problems of navigation require for their solution the aid of closer-steering. Especially, for all observations of deviations arising from the magnetic condition of the ship, the compass should admit of accurate and reliable results.

In view of such considerations, I am led to believe that the compass, as an instrument of observation, the most important to the navigator, should be as perfect in its construction and adjustment as it is practicable to have it; and that, as occasion occurs, in accordance with its special requirements, such limits should be assigned to the errors of observation as may be deemed sufficient for the end to be accomplished.

I beg, however, to be understood, in thus alluding to the possibility of improving the Navy compasses, as not intending to disparage them in the slightest degree. And it is but right to say, in justice to the makers, that they have always responded most promptly to every suggestion of this kind; being apparently desirous to achieve every practicable excellence in the construction of their compasses, even when attended by considerable immediate outlay. It is, therefore, with much satisfaction, that I bring to your notice the following particulars in which substantial progress is now being made in this direction:

First, of the compass card.—A new card-circle has been devised, which, as now made, insures greater precision in all the details of its formation—alike in cutting out, centering, printing, and fixing upon

the card. Two card-magnets, set nearly upon the parallel chords of sixty degrees, will hereafter be provided in all Navy compasses, except those for boat use, in the new construction of the card; by which means the card satisfies conditions more favorable, not only to mechanical stability, but also to the diminution of certain components of compass deviation, which might otherwise result whenever the lengths of the card-magnets have an appreciable ratio to the distances of the nearer masses of iron. And in the new construction it is believed that it will be practicable to gain somewhat in magnetic power by increasing the magnetic moment of the card, without proportionally increasing its moment of inertia. Attention is also being given to the question of securing the utmost permanency in the intensity of the individual magnets. Finally, it is proposed to test the use of sapphire, instead of agate, in the caps of all cards, except those of boat compasses; as, notwithstanding the very small pressure of these cards upon the pivots, (only about fifty grains at the mean temperature,) there is still an appreciable wear of the agates, and, with the alteration of figure, a corresponding increase of friction and diminution of sensibility.

With these improvements actually perfected, in conjunction with the means for a more precise adjustment of the N. and S. line of the card circle to the magnetic axis of the card, it is believed that the card of the Navy compass will have reached a condition quite as satisfactory as, in the nature of the case, it is reasonable to expect.

Secondly, of the azimuth circle.—The feature of making the azimuth circle interchangeable upon every bowl of the same class, alike of those used for steering and for azimuth purposes, has been extended to all the Navy compasses except those designed for boat use. This provision, of advantage in several respects, necessarily requires much nicety of construction of the parts affected by it.

The Messrs. Ritchie are now occupied with several proposed modifications of the azimuth appendages, which promise to add materially in precision and convenience, and, perhaps, in other respects, to the resources of the azimuth circle. These modifications include the use of two prisms instead of one, and of a small spirit-level fixed transversely to the line of sight; through which means the observer, bringing the object into the line of sight, and looking downwards, perfects the contact and reads the card at the coincidence of the prolonged hair-line, apparently projected upon the card divisions, while noticing at the same time, and adjusting for, any deviation from transverse horizontality of the azimuth circle, by the level which is also in the field by reflection. An additional mirror provides for the more precise bearing of an object high in altitude, whenever necessary or expedient, to take azimuths of such objects. It should be added that all the details of these azimuth appendages have been greatly strengthened and rendered correspondingly more stable, when once adjusted by the makers, than heretofore.

These indications sufficiently attest the unwearied attention given by the Messrs. Ritchie, and especially by their senior partner, to the subject of compass improvement; and I think that they afford the promise of ultimately securing a much more perfect instrument of this kind than any hitherto had in Navy use.

But, whatever may be proposed or attempted in this way, should be accompanied by corresponding means of precise adjustment of the several parts of the compass during construction, and of reliable tests of actual condition when completed; otherwise no certainty can be had of progress on the one hand, or of declension on the other; and this subject, I beg to say, has received my particular attention during the past few months.

INSPECTION OF COMPASSES—COMPASS OBSERVATORY.

The liquid compasses, as you are aware, have never been subjected to an examination of their adjustments, at any time, either before or after being received for issue to our ships of war. For this there have been several reasons; but the principal one has been a certain inconvenience in applying any accurate tests of condition to these compasses, on account of the peculiarities of their construction. In the absence of such tests, a substitute has hitherto been found in the acknowledged reputation of the makers for conscientious attention to the details of their compass construction.

But this has hardly seemed a satisfactory state of things, inasmuch as it involves an assumption which, even with the best intentions, cannot be accepted as a certainty, still less can it give us the means of verifying any real or supposed excellence, or even of detecting a serious defect.

With these convictions I submitted to the Bureau, early in the summer, a proposed remedy, which, under all the circumstances, appeared best adapted to the end in view. This was the establishment of a compass observatory, to be located in Brookline, near the Messrs. Ritchies' work-shop, suitably equipped with instruments for a precise determination at any moment of the magnetic meridian, as well as for such concurrent observations in the process of compass adjustment as should be deemed expedient. By such a provision it was intended, in the first place, to supply the makers of the Navy compasses with the means readily accessible for effecting, with every practicable precision, all the fixed adjustments of these instruments, in conformity with the instructions which they might receive from time to time from the superintendent of compasses; and, secondly, on the part of the superintendent, to acquire the requisite facilities, during official inspections, for the needed verifications and other desired tests of condition of all compasses, whether recently made or repaired, prior to their acceptance for Navy use.

After several conferences with the Messrs. Ritchie, it was proposed by Mr. Ritchie, sr., to erect at his own expense on his private grounds a suitable building for the compass observatory, the Bureau on its part to loan the requisite instruments for its complete equipment; it being understood that the observatory, so equipped, was to be freely used by the Messrs. Ritchie, whenever needed for their compass adjustments, and that all its facilities were to be alike available to the superintendent of compasses during his official tests of the finished compasses awaiting his inspection; all being in accordance with the conditions stated in the preceding paragraph.

The conditions of this arrangement having been approved by you in May last, I have now to report that a suitable building for the proposed observatory was erected during the months of August and September, and the principal instruments supplied and put in place on the first of the present month.

The compass observatory, as thus provided, is situated at least a hundred feet distant from any other structure, and has been carefully and thoroughly built, without the use of magnetic material in any part of it. It is furnished with three piers in the line of the magnetic meridian. Upon the south pier is placed a delicate magnetic collimator. Upon the middle pier a theodolite is mounted for observing the collimator, and, by turning over the telescope, for defining the direction of the magnetic

meridian, thus determined, with reference to the magnetic axis of a compass card, or that of a completed compass placed upon the north pier. The whole arrangement is essentially the same as that used for the examination of dry or air compasses by the compass department of the British Admiralty, of which a description was kindly furnished to the Bureau several years ago by the superintendent of that department. Certain modifications are made necessary, in the present case, in the mode of conducting the observations for adjustments and tests of the liquid compasses on account of their peculiarities of construction.

COMPASS DEVIATIONS AND THEIR TREATMENT—MAGNETISM OF SHIPS.

An important part, as I have conceived, of the duties assigned to me has reference to the subject of compass deviations and their treatment on board ship; including under this head the determination of the deviations, as well as the corresponding modifications of the directive and vertical forces, due to the magnetic action of the ship's iron; deducing therefrom the magnetic elements of the ship, and the application of such practical remedies as, in particular cases, may be deemed expedient, from the knowledge thus obtained of the magnetic character of the ship.

For several years past, under a provision of the Navy regulations, our ships of war have generally been swung, before going to sea from their ports of outfit, for compass deviations, and the reports of the observations transmitted to the Bureau of Navigation. At present, nearly all the sea-going ships have wooden hulls, and the deviations of their compasses, due to the magnetic action of the machinery, equipment, and armament, are moderate in amount; and, consequently, there has hitherto been little apparent need of making these results more complete by including observations for magnetic force. But it is now proposed to extend these observations, particularly on board all iron-built ships, to the corresponding determinations of horizontal and vertical force. By means of these additional observations, in connection with greater attention to compass comparisons at different stations on board, simultaneously with the observations for deviation at the standard compass, the requisite data will be had, in the present state of our knowledge of this subject, for forming a definite estimate of the magnetic peculiarities of each ship; and, by repeating these observations, occasionally, at different times, and in different parts of the globe, the materials will be had for a continuous magnetic history of the ship. Such a record is valuable, not only in guiding our general treatment of the compasses on board, and in suggesting rules of action in special emergencies, but in contributing to the progressive development of our knowledge, both theoretical and practical, of that important branch of physical technics known as the magnetism of ships.

In the discharge of this part of my duties, I visited, during the month of June last, the United States steamer Michigan, on the northern lakes; as is well known, the only United States man-of-war on those waters, and the oldest iron-built ship in the Navy.

The Michigan is a paddle-wheel steamer of 450 tons; with hull, bulkheads, and deck-beams of iron, as also her paddle-wheels and wheel-houses. She has wooden masts but iron standing rigging. She has poop and hurricane decks; the cabin being under the former, and a pilot-house on the extreme forward part of the latter. The iron smoke-funnel, $4\frac{1}{3}$ feet in diameter, and 40 feet high, is situated just abaft the

pilot-house, the distance being but 10 feet from the center of one to the center of the other.

The Michigan was built partly in Pittsburgh, and partly in Erie, Pa., her frame having been set up, and other auxiliary fittings accomplished at the former place, then taken down and transported to Erie, where she was put upon the stocks and completed. She was launched in 1844, and hauled into a temporary dock, where she remained about a year, receiving her final fittings and equipment.

While on the stocks at Erie the Michigan was headed, as nearly as I can ascertain at the present time, about SSE., and while in the dock about N. 60° E., or $8\frac{3}{4}$ points to the eastward of her previous position.

The compass equipment of the Michigan consisted of a $7\frac{1}{2}$-inch liquid steering-compass, in the pilot-house, 11 feet above the main deck; a $7\frac{1}{2}$-inch liquid azimuth, used as a standard, 6 feet vertically above the steering compass, on top of the pilot-house; and a 6-inch dry or air tell-tale in the cabin, 7 feet forward of the taffrail and $6\frac{1}{4}$ feet above the main deck. The compasses were all in the fore-and-aft section. Besides the smoke-funnel, which was but 10 feet abaft the two pilot-house compasses, the galley was directly underneath, on the main deck. On the occasion of my visit we placed an additional $7\frac{1}{2}$-inch dry azimuth compass on the poop, 12 feet above the main deck, and 22 feet forward of the taffrail.

Two stations were selected for the observations. The first, at Put-in-Bay, in Lake Erie, in latitude 41° 39′ N., longitude 82° 48′ W.; the second, in Beaver Harbor, at the entrance of Lake Michigan, in latitude 45° 45′ N., longitude 85° 26′ W.; these stations giving the greatest change of latitude, within the limits of the cruise, from Erie to Chicago.

The ship was swung twice on the thirty-two points, and once on the cardinal and quadrantal points at Put-in-Bay; the first for deviations with the iron steam-cutter, which was carried on the port-bow, in davits; the second for deviations with the steam-cutter lowered; and the third for deviations and horizontal force on each of the eight headings, and for vertical force on the cardinal points. She was swung once on the thirty-two points in Beaver Harbor, for deviations on all the headings, for horizontal force on the eight regular points, and for vertical force on the cardinal points alone. The swinging of the ship was effected by warps and kedges, and the observations made by the method of reciprocal bearings. The shore observations were made with a Navy theodolite, reading both the limb and needle arcs; while the bearings on board were taken with the standard compass, accompanied by simultaneous observations of the ship's head, with all the compasses, and of the angle of heel with a spirit-clinometer. All the arrangements for the observations were under the personal supervision of Commander George Brown, United States Navy, commanding the Michigan; and I beg to record my appreciation of the zeal and interest manifested by him, and by all the officers detailed by him as assistants, to obtain results which should be in every respect satisfactory.

Of course, it would be unsuited to the purpose of this report to enter into details, either of the observations themselves, or of the subsequent calculations; but it is presumed that a statement of the principal results, as presented in the following tabular form, together with a brief summary of the conclusions deducible therefrom, will not be inappropriate.

RESULTS OF MAGNETIC OBSERVATIONS, UNITED STATES STEAMER MICHIGAN.

TABLE I.—*Put-in Bay observations, June 23 and 24, 1873.*

Ship's head by compass.	Steam-cutter in davits.				Steam-cutter lowered.
	Compass deviation.		Directive force on board.		Deviation of standard compass.
	Standard or fore compass.	Poop or aft compass.	At fore compass.	At aft compass.	
	°	°			°
N	1.6 W.	2.2 E.	0.605	1.190	1.6 W.
N. E	16.1 W.	10.4 E.	0.667	1.055	16.1 W.
E	23.5 W.	10.2 E.	0.869	0.960	24.6 W.
S. E	18.5 W.	3.6 E.	1.177	0.809	19.1 W.
S	0.5 W.	2.5 W.	1.399	0.804	0.7 W.
S. W	16.9 E.	7.7 W.	1.153	0.860	17.8 E.
W	20.3 E.	12.1 W.	0.847	0.960	22.4 E.
N. W	12.8 E.	8.1 W.	0.653	1.124	12.8 E.

TABLE II.—*Beaver Harbor observations, June 28, 1873.*

Ship's head by compass.	Steam-cutter in davits.	
	Deviation of standard compass.	Directive force on board at standard compass.
	°	
N	4.9 W.	0.501
N. E	22.5 W.	0.609
E	31.0 W.	0.853
S. E	21.5 W.	1.263
S	3.5 E.	1.471
S. W	23.9 E.	1.160
W	27.9 E.	
N. W	15.0 E.	0.547

TABLE III.—*Magnetic elements of the Michigan.*

Places of observation.	Polar force.		Quadrantal force.		Reduced directive force.		Mean vertical force.
	Intensity.	Direction angle.	Intensity.	Direction angle.	Mean northward force.	Mean equatorial force.	
Put-in Bay.		°		°			
Fore compass	0.387	181.3	0.039	9.8	0.948	0.022 W.	0.973
Aft compass	0.195	11.8	0.032	12.8	0.972	0.009 W.	0.837
Beaver Harbor.							
Fore compass	0.509	187.1	0.036	9.7	0.956	0.021 W.	

The deviations and other angles are expressed in degrees and tenths.

The forces, with the exception of the vertical force, are expressed in decimal parts, the earth's horizontal force (directive force on shore) being taken as 1,000. The vertical force is expressed in decimal parts, the earth's vertical force being taken as 1,000.

The direction angles are reckoned from the ship's head, round the circle, by starboard, stern, and port.

Explanation of the tabular results.—Table I, of the Put-in Bay observations, gives the deviations at both the fore and aft compasses, and the

directive force acting at those compasses, on the eight principal headings of the ship; the deviations being expressed in degrees and decimals to the nearest tenth, and the directive force in decimal parts, the earth's horizontal force (directive force on shore) being taken as unity, or 1,000. These observations were made with the steam-cutter in davits. The detached column at the right gives the deviations alone, on the same headings, with the steam-cutter lowered. The deviations obtained on the eight principal headings, concurrently with the observations for horizontal force, were nearly identical with those obtained on the same headings in the first complete set, with the steam-cutter in davits, and are not here given.

Table II of the Beaver Harbor observations gives the results in that place, corresponding in all particulars with those of Table I.

Table III gives the magnetic elements of the ship, as deduced from the observations for deviation and magnetic force. Of these, the *polar force* is the resultant of the permanent horizontal magnetism and transient vertical magnetism of the ship—the two components acting upon the compass in the same manner—that of a permanent magnet. The polar force of the ship is variable in different geographical positions, depending on the horizontal force and dip among the earth's magnetic elements.

The quadrantal force is the transient horizontal magnetism of the ship, and remains unchanged in different places.

The mean northward force is the mean of all the values of the directive force acting in the direction of the compass, reduced to the magnetic meridian, for any number of equidistant headings round the circle of swing. It is a constant.

The mean equatorial force is a similar mean for the directive force, reduced to the magnetic equatorial. As a magnetic force, therefore, it has no real value, except where there is iron unsymmetrically placed with respect to the fore and aft section of the ship; but it always involves whatever constant error may exist in the compass, either from defective adjustments, or being out of the fore and aft section. In the case of the Michigan, it is believed to be mainly, if not wholly, due to instrumental errors.

The mean vertical force is the mean of the different values of the whole vertical force acting at the compass, for any number of equidistant headings round the circle of swing. It is made up of the earth's vertical force, and the permanent and transient vertical magnetism of the ship. It is variable for changes of geographical position, like the polar force of the ship.

General conclusions.—Referring first to the Put-in Bay observations, it will be seen that there is a marked difference between the deviations of the fore compass and those of the aft compass. Thus, at the fore compass the deviations are not only quite large, exceeding two points at their maximum, but they are left-handed, or westerly on easterly headings, and easterly on westerly headings. At the aft compass, on the other hand, the deviations, while only about half as large, are right-handed, or easterly on westerly headings, &c., and a corresponding difference exists in the directive force at the two compasses. This is a minimum on northerly headings and a maximum on southerly headings at the fore compass, while it is just the reverse at the aft compass; the differences between the extremes and unity (1,000, or the relative directive force on shore) being proportionally greater at the fore compass than at the aft-compass station.

The results of the Beaver Harbor observations, while similar in these

several particulars to the former, are noteworthy in this: that they show a decided increase in the deviations; those of the fore compass, at their maximum, being nearly three quarters of a point larger than those in Put-in Bay. A comparison of the magnetic elements (Table III) shows that the polar force at the fore compass, in Beaver Harbor, is a quarter larger than at the former place. Similarly, the directive force on board, at the same compass, (Table II,) as deduced from observations entirely independent of those furnishing the deviations and polar force, is proportionally smaller on northerly headings and larger on southerly headings in Beaver Harbor than in Put-in Bay.

These changes in the magnetic forces of the ship, as well as in the compass deviations depending thereon, are undoubtedly attributable to the differences in the earth's magnetic elements consequent upon the change of geographical position.

It will be noticed that the present polar magnetism of the ship is very nearly symmetrical with the mid-ship or fore-and-aft section, as referred to either compass-station fore or aft. This appears from the deviations, of which the neutral points, or points of no deviation, correspond to north and south headings by compass, while the maximum deviations obtain very nearly on the east and west headings. It is also shown by the direction-angles of the polar forces, (Table III;) these forces, while acting in nearly opposite directions, deviating but a few degrees from the midship section.

The influence of the iron steam-cutter, as shown by a comparison of the deviations in Table I, although appreciable, is evidently unimportant.

The original polar magnetism of the Michigan, as developed while she was being built, and its relations to her present condition.—It is to be regretted that we have no records of any early observations on board the Michigan from which we can obtain even a clue to her original magnetic character, and therefrom to the changes which have since taken place. The only record of compass observations, earlier than those of the past season, is that of one complete set for deviations, made in June, 1868, in the harbor of Erie. These were taken with the standard compass, then, as now, on the top of the pilot-house, and in identically the same position. No comparisons at other compass positions on board, nor any observations for force, appear to have been made. The subjoined table gives the deviations on the eight principal headings, from which I have deduced the corresponding magnetic elements, so far as obtainable, without any data from force observations:

Ship's head by standard compass.	Deviations of standard compass.
N.	3.0 E.
NE.	14.5 W.
E.	24.2 W.
SE.	20.2 W.
S.	1.7 W.
SW.	20.3 E.
W.	29.1 E.
NW.	21.9 E.

Magnetic elements.	
Polar force—	
Intensity	0.464
Direction angle	174.7
Quadrantal force—	
Intensity	0.023
Direction angle	331.2
Mean equatorial force	0.029 E.

These results, with reference to the fore compass of the Michigan, show that her polar force was decidedly greater five years ago than at

the present time, as found at Put-in Bay. The direction angle also shows that the polar axis of the ship, while nearly as now coinciding with the fore-and-aft section, actually bore a few degrees to the port-side of the ship's head. Probably a small portion of this excess is attributable to the difference in the terrestrial magnetic elements at Erie, as compared with those at Put-in Bay; but the larger part, doubtless, represents the higher magnetic condition of the ship at that time.

In the absence of any observations of an earlier date, we can only infer the probable direction of this ship's original permanent magnetism from a knowledge of her heading while being built. While on the stocks her head was about S. SE., and while subsequently fitting in the dock, about NE. by E. Hence, without more particular information concerning the circumstances of her building and fitting, we may conclude that the original direction of the permanent magnetism, as developed on the stocks, was through her starboard-bow and port-quarter, with south polarity in the former and north polarity in the latter; and that, if this were modified subsequently by the operations of fitting, the direction would have veered more or less to starboard.

But whatever may have been her original magnetic condition, or the changes to which it has been subjected, it appears quite evident that the present general magnetism of the ship is truly shown at the aft compass.

At this compass-station the present direction-angle of the polar force is about a point from her head to starboard, or within a point of coinciding with the fore-and-aft section. But the polar force being composed of both the transient vertical magnetism and permanent horizontal magnetism, and the former being directed from the compass toward the head, it follows that the direction of the latter component must make a still larger though unknown angle from the ship's head than the polar force itself; and consequently, it appears quite probable that the permanent magnetism of the ship continues to have its direction not very different from what it was, as originally developed while the ship was on the stocks. If this be so, it would suggest a remarkable stability, at least in the direction of the ship's permanent magnetism. And it is not altogether improbable in view of the admirable quality of the iron in the hull of the Michigan. I was informed by Commander Brown that, on the occasion of having her hull uncovered for cleaning and painting last spring, it was found in a remarkable state of preservation. It had indentations, and some of them quite large ones, over all parts of the bottom, illustrating the effects of her experiences in frequent groundings; but there was neither fracture nor any very sensible abrasion to be seen.

The polar force at the fore-compass station on the other hand is directed about sixteen points from the head to starboard, or toward her stern, very nearly in the fore-and-aft section. In view of the elevated position of this compass, it is not probable that the component of permanent horizontal magnetism exercises much influence upon it; so that the effect of the large polar force, with an intensity equal to half that of the earth's horizontal force in Beaver Harbor, must be mainly due to the component of transient vertical magnetism developed in the funnel in so close proximity, whose upper part, possessing decided south polarity, strongly attracts the N. point of the compass-card; thus neutralizing half of the earth's directive force on northerly courses, and producing the large left-handed deviations observed at that compass.

Effect of heeling upon compass deviations.—The possible effect upon the deviations of the compass on board an iron ship, while being heeled

or listed over, is often an important question; as it is not an unfrequent occurrence that the deviations, as ascertained with the ship on an even beam, are changed—increased by heeling in one direction, and decreased by heeling in the opposite direction—as much as 5°, 10°, or even 15°, with a heel of but 10°.

In the case of the Michigan, I regret not being able to obtain a few observations, more as a test of theoretical conclusions than from practical considerations, of the effect of heeling in that ship. The attempt was once made; but the ship was well down in the water, (her bunkers being full of coal), and it was found very difficult, with the means at command, to get her over more than two to three degrees. Fortunately, from our knowledge of her heading while being built, and especially with that recently acquired of her actual magnetic condition, we are warranted in concluding that the effects of heeling in her case could not be a matter of much concern.

With the data of our observations, it is easy to compute the *heeling co-efficients*, for both the fore and aft compasses of the Michigan. These are numerical quantities, which depend on the values of certain magnetic elements of the ship, (Table III,) such as the mean northward force, the mean vertical force, and the quadrantal force, but involve, also, as a factor, the tangent of the magnetic dip. Thus, in the present case, we have:

For the standard or fore compass—

Heeling co-efficient in Lake Erie, 0°.09 for each degree, or 0°.9 for 10 degrees of heel.

Heeling co-efficient in Lake Michigan, 0°.11 for each degree, or 1°.1 for 10 degrees.

For the poop or aft compass—

Heeling co-efficient in Lake Erie, 0°.3 for each degree, or 3°.0 for 10 degrees of heel.

Heeling co-efficient in Lake Michigan, 0°.4 for each degree, or 4°.0 for 10 degrees.

In the first case, or at the standard compass, the deviation from heeling would be toward the high or weather side of the ship; in the second case, toward the low or lee side. These are the maximum effects, as found for north or south headings of the ship, which decrease with headings toward the eastward or westward, in the ratio of unity to the cosine of the heading.

These results show that the heeling effect should be hardly appreciable at the top of the pilot-house, and even at the station on the poop not sufficiently so to require attention, except with a large heel on northerly or southerly courses.

Compass treatment on board the Michigan.—It will be evident, I think, from what has already been said, that the positions of the standard and steering-compasses on board the Michigan are very unfavorable, with reference to the magnetic action of that ship. Doubtless, the peculiar experience of the ship makes it expedient to have the helmsman and steering-compass where they now are, in convenient proximity to the station occupied by the pilot; but it would appear that the standard compass might, at least, be more judiciously placed on the poop, where the deviations are comparatively moderate and in normal relations to the general magnetism of the ship. In that case, moreover, the telltale in the cabin would always be in close accord with the standard.

With such a disposition of the compasses, the question would properly arise as to the expediency of applying correctors to the steering-compass, in order to free it from the excessive deviations to which it is

now subject. On account of the relatively very small quadrantal force, (Table III,) it would only be necessary to correct for the polar force. This might easily be done by a proper adjustment of fixed magnets; and such would be sufficient if, in the cruises of the Michigan, she never deviated much from the same parallel of latitude. This, however, is not the case of the Michigan, for in her movements through the upper lakes, she not only changes her latitude several degrees, but, as it happens in those waters, she encounters more than a proportional change in the earth's magnetic elements, with a corresponding change in her own magnetic condition. Consequently, fixed magnet correctors would be insufficient; for, while the changes in their action upon the compass would be subject to the same law as the changes in the action of the permanent horizontal magnetism, they would be entirely different from the changes in the transient vertical magnetism; and this component, as previously remarked, is undoubtedly preponderant in the composition of the polar force acting at the pilot-house. The practical result, therefore, would be that, while the compass would remain tolerably well adjusted in Lake Erie, an error might appear in Lake Huron, increasing in amount as the ship traversed the northern waters into Lake Michigan. And such an error, because unsuspected, is always of more serious concern. In fact, I was informed on board the Michigan, that magnet-correctors had been formerly applied to the pilot-house compasses, but that so much confusion resulted in the compass indications, it was deemed expedient soon afterward to remove them.

The proper procedure, in attempting to compensate for the polar force in the Michigan, as in other similar cases, is to provide correctors in part of horizontal magnets, and in part of vertical iron rods; the magnets to equalize that part of the polar force due to the permanent horizontal magnetism, and the vertical iron rods to equalize that due to transient vertical magnetism. But this, unless we know the relative proportions of the two parts, must be a tentative operation, and is liable to lead to uncertain results when the ship goes into distant waters. Hence, whenever it can be done, we should determine, in advance, the relative proportions of the two components of the polar force. Unfortunately, this is not always practicable. Still, it may always be done, with the data easily obtainable from observations at two different places, sufficiently distant apart to furnish decidedly different values of the magnetic dip and relative horizontal force of the earth.

Otherwise, magnets alone may be used as correctors of the polar force; but, in this case they must be movable, and admit of being adjusted from time to time by the navigator, as found necessary from actual observation of the changes in his compass deviations.

I have the honor to be, very respectfully, your obedient servant,

B. F. GREENE,
Professor of Mathematics, U. S. N.,
Superintendent of Compasses.

Commodore DANIEL AMMEN, U. S. N.,
Chief of the Bureau of Navigation, Navy Department.

HYDROGRAPHIC OFFICE, BUREAU OF NAVIGATION,
Washington, August 8, 1873.

SIR: In compliance with the directions of the Bureau, I respectfully submit the accompanying estimates for this Office for the fiscal year ending June 30, 1875.

During the fiscal year ending June 30, 1873, the work of this Office has progressed favorably, though from the want of space and from the small number of available officers, as also from delay in publishing at the Congressional Printing-Office, it has not been expedited as I could have wished. Three books of sailing directions have been published, together with the yearly lists of foreign lights; hydrographic notices and notices to mariners and other manuscript have been completed at this office, and are awaiting publication. Fifty-eight chart-plates have been corrected, and one hundred and nineteen charts prepared and added to the catalogue by the process of photo-lithography, and nine new charts are in process of engraving; there have been sold from this office (to its agents) two thousand eight hundred and seventy of its publications on navigation, &c., and four thousand nine hundred and ninety-two charts, besides the supply issued to the vessels of the Navy.

A party has been organized at this office, and the necessary instruments are being prepared, for the determination, by electric telegraph, of the longitudes of the West India Islands, and the points on the northern coast of South America where the telegraphic cable has been laid; the present longitudes of most of these points are but approximate, and their correct establishment, important geographically and to navigation, entails but a small expense, a great part being for instruments, which are always required at this office.

The work of the survey on the Pacific Ocean by the United States steamer Portsmouth, Commander Skerrett, United States Navy, and the United States steamer Narragansett, Commander Dewey, United States Navy, is well under way. The results of this work will be of great benefit to commerce and navigation. I deem it very desirable that a small vessel should be employed as a surveying vessel in the West Indies, where there is much surveying yet to be done, and that another should be employed in surveys of the channels of commerce in Asiatic waters. Two large tugs would be suitable for the purpose.

Permit me again to ask your attention to the *necessity* of increased accommodations for this office, and to the purchase of a building by the Government for its work, and for the preservation of the valuable material now collected and constantly increasing. The necessity was acknowledged by the Naval Committee of the Senate, at the last session of Congress, and a bill introduced for the purchase and improvement of a building. From the increase of the office this requirement becomes every year more urgent. At present, in the rented building now occupied, there is neither sufficient space for the employés nor for the material. No portion of the building is fire-proof, and consequently it is unsafe for guarding valuable Government property; and the number of rooms, twenty-two, required for the use of this office is too great, I estimate, to admit of the idea that rooms may be found in the building now in course of construction for the Navy Department.

Very respectfully, &c.,

R. H. WYMAN,
Commodore U. S. N., and Hydrographer.

Commodore DANIEL AMMEN,
Chief of Bureau of Navigation.

UNITED STATES NAVAL OBSERVATORY,
Washington, October 9, 1873.

COMMODORE: I have the honor to submit the following report of the work of the Naval Observatory within the past year:

ASTRONOMICAL WORK.

The Equatorial.—This instrument has been employed in making observations of the small planets and comets, and in observing occultations of stars by the moon. The number of the small planets is now so great, namely, 133, and the ephemerides are frequently so much in error, that much time and labor are required to find and observe them. If accurate ephemerides could be provided, such observations would be more easily made with the meridian circle.

Five comets have been observed, three of which are periodical: (1) the periodical comet discovered by Tempel in 1867; (2) the new periodical comet discovered by Tempel on July 3, of the present year; (3) the comet discovered by Borelly at Marseilles, August 20; (4) the comet discovered by Henry at Paris, August 23; and (5) the well-known periodical comet of Brorsen.

The instrument and chronograph are in good working order. The driving-clock, however, attached to this instrument, is of an antiquated pattern, and it appears to be impossible to make it perform as well as we could wish.

The observations have been made by Professor A. Hall and Assistant Observer A. N. Skinner. Mr. Skinner has determined a new value of a revolution of the micrometer-screw, from the observations of stars near the pole.

The zones of stars observed here with the meridian circle in the years 1847, 1848, and 1849 have been printed. They were arranged and prepared for the press by Professor Hall.

The great Equatorial.—The dome for this, the largest instrument of its kind in the world, is now finished and ready for the reception of the telescope, which is nearly completed, and will probably be mounted during the present month—two years in advance of the time specified in the contract with the makers, Messrs. Alvan Clark & Sons, of Cambridgeport, Mass.

Transit instrument and Mural circle.—With the exception of a few nights' work with the transit instrument, Prof. M. Yarnall has been engaged in observing with the mural circle. The stars observed were such as were supposed not sufficiently observed in the catalogue just published. Professor Yarnall has finished the computations on the catalogue, and, with the assistance of Mr. Skinner, has read the proof-sheets of it as they passed through the press. With Mr. Skinner's assistance, he read the proof-sheets of the volume for 1871, which is about to be issued from the press. He has, with the assistance of Mr. Skinner and Professor Lockwood, reduced the observations made with the mural circle in 1872; except copying, the observations with the mural circle for that year are now ready for the printer. He has also reduced nearly half the stars observed in the current year with mural circle.

The Transit circle.—This instrument is in charge of Professor William Harkness, assisted by Professor J. R. Eastman, and Assistant Observers Edgar Frisby and Ormond Stone. Early in April, Professor Edward S. Holden reported at the Observatory, and on the 15th of that month, he also was assigned to duty as an ssistant on this instrument. It has been employed on the sun, m and planets, and on a large list of miscellaneous stars, whose places were required for the reduction of observations made with the equatorial, as zero-points for the formation of a catalogue from the zone observations made here in the years 1846 to 1849; and for the use of Lieut. G. M. Wheeler, of the United States Engineers, in the reduction of the zenith-telescope work of his parties

engaged in surveying and exploring the Western Territories. Only so many nautical-almanac stars have been observed as were necessary for the determination of time and azimuth. Owing to the prevalence of cloudy weather to an almost unprecedented extent, the number of observations will probably be somewhat less than the average. Advantage has been taken of this circumstance to bring up the computing, which was considerably in arrears.

The condition of the transit circle is very satisfactory; no changes of any importance have been made either in it or in any of its subsidiary apparatus. The only things which have given any trouble are the shutters which close the observing slit, and it will be necessary to make extensive alterations in them before they will work properly.

Theory and tables of the moon.—Since the date of the last annual report, the first part of Professor S. Newcomb's investigation of the moon's motion has been nearly completed and prepared for the press, according to the original plan. But, on examing certain terms troublesome to calculate, which it was supposed were entirely unimportant, it was found that this supposition was erroneous, and that the work could not be properly completed without them. The preparations for observing the transit of Venus have not allowed Professor Newcomb the period of uninterrupted study necessary for this calculation, which, therefore, remains unfinished. The computations for the second part of the work have been carried as far as they can be carried without the star denominations mentioned in my last report; and these cannot be obtained until the observations are completed and reduced. It is hoped that after the preparations for observing the transit of Venus are completed, both parts of the work will be speedily finished and prepared for publication.

Transit of Venus.—The details of the preparations for the observation of the transit of Venus devolving upon the officers of the Observatory, composing a majority of the members of the Commission authorized by Congress, have occupied a large portion of the time of those officers, in addition to their routine duty. The work progresses favorably, and the expeditions are expected to leave for their stations early next June.

TELEGRAPHIC APPARATUS, ETC.

The telegraphic apparatus, in charge of Professor Harkness, assisted by Mr. William F. Gardner, the instrument maker, continues in excellent order, and has been much extended. As usual, the fire-bells in the city have been struck every day at 7 a. m., 12 m., and 6 p. m.; the time-ball on the dome of the Observatory has been dropped daily at noon; and time-signals have been sent to the main office of the Western Union Telegraph Company at the same instant. The distribution of these signals by the telegraph company has of late been greatly extended. Formerly they were confined to the region of country between the Atlantic Ocean and the Mississippi River, and Baltimore and the Gulf of Mexico; but now our signals go directly from the Observatory to the main office of the company in New York City, and from thence they are distributed to nearly every State in the Union. The immediate object of these signals is to furnish accurate and uniform time to the railroads; and, throughout the whole of the vast territory in question, there is scarcely a train whose movements are not regulated by the Observatory clocks.

The clocks at the Navy Department, and at the Army Signal-Office, controlled from the Observatory, have continued to perform in such a

satisfactory manner that the system has attracted attention, and there is a prospect that it will soon be extended to all the principal Government offices in this city. Early last spring, the Treasury Department decided to procure a clock similar to that in the Army Signal-Office, and it was placed in position and connected with the Observatory wire on May 16. Since then it has been running very well. The Western Union Telegraph Company have also placed a similar clock in their main office in this city, in order to facilitate their distribution of time-signals to the railroads.

The new main switch-board, for which an appropriation was made last winter, has been ordered, and it will soon be ready for use. It will be capable of receiving 110 wires, and will facilitate very much the management of our telegraphic apparatus. No longitude operations have been undertaken during the year.

METEOROLOGICAL OBSERVATIONS.

In the meteorological department, in charge of Professor Eastman, the regularity of the observations has been maintained; and the usual observations with the barometer, dry, wet, and solar thermometers, have been made at 0^h, 3^h, 6^h, 7^h, 9^h, noon, 3^h, 6^h, 9^h, on each day. The observations for 1871 have been prepared for the press, and are now in the hands of the printer; and the observations of 1872 are also ready for printing. Cloudy weather prevented observation of the meteors of November 14, but those of November 27 were observed. A few meteors were observed on the night of August 10; but it is probable that the thickest part of the stream passed before the 10th.

CHRONOMETERS.

Ten large compartment cases, capable of accommodating in all two hundred and two chronometers, occupy the center and sides of the chronometer-room, with the standard mean-time clock and its telegraphic connections. In the receiving cases are, at this date, seventy-six chronometers by different makers, from which careful selections are made with reference to the station to which the vessel to be supplied is assigned. These instruments are wound and compared with the mean-time standard, daily. Their differences are entered on the comparison forms, and their rates and the mean temperature of the cases in the chronometer journal every tenth day, and on the "trial" forms for six months or a year, consecutively, as they are tested for repairs, or under trial for purchase. The rule, in each instance, is the severe one of applying twice the difference between the greatest and least rates during the entire period to the mean of the monthly variations, and rejecting those in excess of eight seconds. Fifty-three of these instruments have been under six months' trial since last report, forty-nine of which came within the limit required, under the mean annual temperature of 76° Fahrenheit, four only being rejected. There are now under trial, and due this year, twenty-three box-chronometers. The result of trials fully sustains the high reputation of the instruments made by the Messrs. Negus, of New York City, for accuracy and regularity of performance under variations of temperature; and the repairs put by them on the chronometers belonging to the Navy have proved satisfactory.

Since October, 1872, there have been received from all sources eighty-three box and five pocket chronometers, and sixteen silver comparing-watches; fifty-six have been issued by order of the Bureau to vessels

and hydrographic surveying expeditions, seventy-nine box and three pocket chronometers have been sent to the maker for cleaning, recompensation, and repairs, and five box-chronometers have been withdrawn from service as unreliable instruments in navigation.

The officers who have been on duty in the chronometer department from the date of last report to date of detachment, respectively, are as follows: Commander James H. Gillis, (in charge,) to April 25; Commander W. W. Queen, to June 23; Lieut. F. W. Greenleaf, to August 25; Master Albert Ross, to March 31. The officers on duty at present are: Commander A. W. Johnson, since May 2, (in charge;) Lieut. Commander S. W. Terry, since July 10; Lieut. Isaac Hazlett, since November 1, 1872; Lieut. Lambert G. Palmer, since October 1, 1873.

In addition to the routine duty of winding, comparing, and computing rates, temperatures, and trials, selecting chronometers for issue, as they are ordered by the Bureau, and having them cleaned and repaired at the proper time, the collation of the history of each from the date of its manufacture and purchase has so far advanced as to show the length of service of nearly all the chronometers belonging to the Navy, the repairs put upon each one at various times, the dates when cleaned and re-oiled, the comparison of the numbers obtained by repeated trials, and the performance of each in the past and its reliability for the future. A tabular abstract of the chronometers on hand for each month, which supplies a ready and convenient index to the volumes, rates, histories, and "trial" papers, has been recently introduced, and is found to be of great usefulness in securing method and accountability. A paper embracing the details of this service is in course of preparation for the instruction and guidance of officers who may be hereafter assigned to duty in this department of the Observatory.

From the chronometer room the daily time signals are sent, and the noon-time ball dropped by the telegraph wires.

The instrument-maker, Mr. Gardner, is charged with keeping in working order the astronomical instruments, batteries, &c., and he gives attention, in assisting Professor Harkness, to the telegraphic connections of the motor-time standard at the Observatory.

In the estimates submitted for the coming year an appropriation is asked for to cover the cost of a chronometrical thermometer, for use in the chronometer room. This instrument is compensated to run on mean-time under a known temperature, showing by its gain or loss in any given interval the mean temperature of its locality, and it furnishes the means of determining the daily rates of chronometers in the order of temperature. Such an instrument has been long employed for this purpose in the royal observatory at Greenwich, and it affords a more accurate measurement of temperature than the self-registering thermometer.

THE LIBRARY.

The increase of the library continues to be chiefly through its home and foreign exchanges. This increase has been steadily maintained. A few astronomical and mathematical works of the highest character have been recently purchased.

The demands for our annual volumes, and for their special treatises published separately in appendices, have been liberally answered. Of the seven hundred copies of the astronomical and meteorological observations made during the year 1870, and received from the Government Printing Office in April last, less than one hundred copies remain as a reserve for special calls. Fifty copies were retained from the Ob-

servatory, as usual, to be placed at the disposal of the Library of Congress for their exchanges.

Besides the annual volume for 1870, three of the four appendices of the volume for 1871, (now in press,) have been issued separately in advance, and have been mostly distributed, viz: No. II. Results of Washington Observations from 1853–'60; No. III. Catalogue of Stars Observed from 1845–'71; No. IV. Memoir of Founding and Progress of the Observatory. The first of these represents part of the astronomical work during the years named, for which years no volume had previously issued from the Observatory. Other work of those years is now being prepared for publication. The second appendix named above (No. III) is a star catalogue, embracing between 80,000 and 90,000 observations made by Professor Yarnall—the results of his labors of more than twenty years—giving the places of more than 10,000 observed stars.

Appendix No. I for this volume, "Zones of Stars Observed with the Meridian Circle in the years 1847, '48, and '49, by Professor Major and Lieutenants Maynard and Muse," is early expected from the Congressional Printer for distribution.

PUBLICATION OF RESULTS.

Observations to be of any value to the world must be published; if they are not, the time and labor spent upon them are simply wasted. And yet they are so much more easily made than reduced, that nothing is more common than to see them lie for years before the computations necessary to fit them for publication are completed. The warm interest which the Bureau has taken in the Naval Observatory has enabled me to resuscitate from our store-rooms the zones of stars observed here from 1846 to 1849, and those observed by Capt. J. M. Gilliss, in Chili, from 1850 to 1852. The former have been already issued in form of appendices (Nos. II and IV) to our annual volumes for 1869 and 1870; and considerable progress has been made in forming a star catalogue from them. An appropriation having been made by Congress last winter for finishing the reduction of Captain Gilliss's zones of stars observed in Chili, they are now in such a state of forwardness that the resulting star catalogue will appear in our volume for 1873. Thus it will be seen that nearly all the valuable observations which were locked up in the archives of the Observatory have been given to the world.

I have made it my constant endeavor to bring everything up to date. Under the most favorable circumstances, the annual volume of observations cannot be issued in less than about sixteen months after the expiration of the year to which it belongs. The volume for 1871 is now printed, and as soon as it can be bound it will be ready for distribution. Our current work is, therefore, only about six months in arrears.

Very respectfully, your obedient servant,

B. F. SANDS,
Rear-Admiral, Superintendent.

Commodore DANIEL AMMEN, U. S. N.,
Chief of Bureau of Navigation, Navy Department.

NAUTICAL ALMANAC OFFICE,
Washington, D. C., October 17, 1873.

SIR: I have the honor to submit the following report of the operations of this Office during the past year:

The preparation of the American Ephemeris and Nautical Almanac

has continued, as in previous years, without change in the means and methods employed, except that the tables of Uranus, prepared by Prof. S. Newcomb, United States Navy, have been substituted for those previously used.

The ephemeris for each year comprises all relating to the places of the sun, moon, principal planets, and standard stars, with predictions of eclipses and occultations, that is desired by astronomers in such a work. The demand for it has increased, so that during the past year nearly 350 copies have been sold, and more than 1,100 copies have been distributed to the ships and stations of the Navy, to the surveying and exploring parties of the Army, the Coast-Survey and the Land-Office; to observatories and astronomers, and to various colleges and other public institutions, especially to those in which astronomical observations or investigations are conducted.

A smaller volume, containing the first half of the complete ephemeris, is published for the use of navigators. More than 4,000 copies of the almanac of each year are required for the supply of merchant ships.

There have been printed during the year 100 copies of the ephemeris for 1873; 700 of the ephemeris for 1874; 495 of the ephemeris for 1875; 500 of the ephemeris for 1876; 300 of the small almanac for 1873; 3,000 of the small almanac for 1874; 1,000 of the small almanac for 1876; and 200 of tables of Venus.

The ephemeris for 1875, at the time of my last report stereotyped and ready for the press, was received from the printer early in November of last year. The small volume for 1876 was received in April, and the complete ephemeris for that year early in September of the present year.

The greater part of the ephemeris for 1877 is in the hands of the printer, and it is expected that the entire volume will be prepared before April next. The ephemeris of the sun and a portion of that of the moon, for 1878, have also been prepared.

Arrangements have been made for the computation of tables and ephemerides of twenty-six of the thirty-nine small planets discovered by American astronomers. It is very desirable that the small appropriation for that purpose should be renewed for the next fiscal year.

I have already submitted estimates for that year.

I am, very respectfully, your obedient servant,

J. H. C. COFFIN,
Prof. Mathematics, U. S. N., Superintendent.

Commodore DANIEL AMMEN, U. S. N.,
Chief of Bureau of Navigation, Navy Department.

BUREAU OF NAVIGATION, SIGNAL-OFFICE,
Navy Department, Washington, October 30, 1873.

SIR: I have the honor to report that the duties of this Office, since I relieved Commodore Almy as chief signal-officer of the Navy, on July 1, have been confined to the preparation of a tactical signal-book, which is now in course of publication, and which, it is believed, will meet a want long felt in the Navy.

Very respectfully, your obedient servant,

FOXHALL A. PARKER,
Commander United States Navy.

Commodore DANIEL AMMEN, U. S. N.,
Chief of Bureau of Navigation, Navy Department.

Estimate of appropriations required for the service of the fiscal year ending June 30, 1875, by the Bureau of Navigation.

FOR THE SUPPORT OF THE BUREAU OF NAVIGATION.

For salary of chief clerk, (act approved July 5, 1862, section 3)	$1,800
For salary of one clerk of third class, (act of July 23, 1866, section 8, and July 12, 1870, section 1)	1,600
For salary of one clerk of second class, (act of July 23, 1866, section 8, and July 12, 1870, section 1)	1,400
For salary of messenger, (act of July 5, 1862, and proviso of March 3, 1869)	840
For salary of laborer, (act of February 25, 1863, and proviso of March 3, 1869)	720
For contingent expenses	800
Total	7,160

A.

1. FOR NAVIGATION.

For foreign and local pilotage, and towage of ships-of-war	$50,000
For services and materials in correcting compasses on board ship, and for adjusting and testing compasses on shore	3,000
For nautical and astronomical instruments, nautical books, maps and charts, and sailing-directions, and for repairs of nautical instruments for ships-of-war	10,000
For books for libraries of ships-of-war	3,000
For Navy signals and apparatus, namely, rockets, signal lights and lanterns, including running-lights, and for drawing and engraving for signal-books	6,000
For compass-fittings, including binnacles, tripods, and other appendages of ships' compasses	5,000
For logs and other appliances for measuring the ship's way; for leads and other appliances for sounding	5,000
For lanterns and lamps, and their appendages, for general use on board ship, including those for cabin, ward-room, steerage, holds, spirit-room, and for deck and quartermasters' use	5,000
For bunting and other materials for flags, and for making and repairing flags of all kinds	6,000
For oil for ships-of-war, other than that used in the engineer department; for candles when used as a substitute for oils in binnacles and running-lights; for chimneys and wicks; and for soap used in the navigation department	22,000
For stationery for commanders and navigators of ships-of-war	4,000
For musical instruments and music for ships-of-war	1,000
For steering signals and indicators, and for speaking-tubes and gongs for signal communication on board ships-of-war	2,500
Total	122,500

2. FOR CIVIL ESTABLISHMENT.

For civil establishment in the navigation department at the several navy-yards	$20,000

3. FOR NAVIGATION CONTINGENT.

For freights and transportation; postage and telegraphing on public business; advertising for proposals; packing-boxes and materials; and all other contingent expenses	$6,000

4. FOR NAVIGATION, HYDROGRAPHIC WORK.

For drawing, engraving, and photo-lithographing charts, correcting plates, preparing and publishing sailing-directions, and other hydrographic information	$20,000
For making charts, including those of the Pacific coast	30,000
For fuel, lights, and office-furniture; care of building, and other labor; purchase of books for library; drawing-materials, and other stationery; postage, freight, and other contingent expenses	7,000
For rent and repair of building	2,800
Total	59,800

B.

1. FOR NAVAL OBERVATORY.

For one clerk	$1,800
For three assistant observers, at $1,500 each	4,500
For wages of one instrument-maker, three watchmen, one messenger, and one porter; keeping grounds in order, and for repairs of buildings and inclosures; for fuel, lights, and office-furniture; purchase of books for library, and chemicals for batteries, stationery, freight, and all other incidental expenses	13,500
For transcribing astronomical observations for publication	1,200
For one chronometrical thermometer, (submitted)	550
For painting buildings and fences, (submitted)	1,000
Total	22,550

2. FOR TOWER FOR TELESCOPE.

For purchase of furniture and equipments for the new building for great telescope	$2,000

3. FOR REFRACTING TELESCOPE.

For last payment for great refracting telescope in course of construction	$10,000

C.

1. NAUTICAL ALMANAC.

For pay of computers and clerk for preparing for publication the American Ephemeris and Nautical Almanac	$20,000
For continuance of work on new planets discovered by American astronomers	3,000
For rent, fuel, labor, stationery, boxes, expresses, and miscellaneous items	1,500
Total	24,500

RECAPITULATION.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1875, *by the Bureau of Navigation, Navy Department.*

FOR SUPPORT OF BUREAU.

Salaries and contingent	$7,160

FOR THE NAVAL SERVICE.

A.—1. Navigation	$122,500
2. Civil establishment	20,000
3. Navigation contingent	6,000
4. Hydrographic work	59,800
B.—1. Naval Observatory	22,550
2. Tower for telescope	2,000
3. Refracting telescope	10,000
C.—Nautical Almanac	24,500
	267,350

No. 6.

BUREAU OF ORDNANCE.

BUREAU OF ORDNANCE, NAVY DEPARTMENT,
November 1, 1873.

SIR: I have the honor to submit the annual report of this Bureau, with accompanying estimates for the fiscal year ending June 30, 1875.

While engaged in the ordinary duties of preparing ships for sea-service, supplying their requisitions while abroad, and preserving the public

property under its charge, the Bureau has not been unmindful of the very important questions connected with the armament of ships of war, nor of new means for offense and defense, in order that we may keep pace with the work of other nations.

The appropriations for experimental purposes were so far limited as to prevent the Bureau from making full investigation of many devices and theories which have either originated here, or were brought to public attention abroad.

A very large amount of information, nevertheless, has been collected, and arranged for future reference whenever opportunities may be afforded for experiment; and within the scope of the expenditures allowed by Congress much has been done in the way of preliminary inquiry.

The small battery near Annapolis is gradually being brought into working order, and during the next season will be in readiness for efficient experimental work.

It has been supplied with the best apparatus for observing ranges and velocities; it can also afford heavy practice against armor-plating, when required.

The solution of the powder question in respect to the relation of velocities to pressures, first prominently brought forward by General Rodman, remains the most important, and therefore receives special attention. It is one in which theories are of no avail. Experiment alone can determine the qualities required in different guns, and I have pleasure in informing the Department that the most satisfactory results have been obtained in this direction.

While seeking to obtain the highest velocity due to a given charge of powder, care must be taken to reduce to a safe limit the rupturing force, and to make them uniform in their action. To this end a series of experiments in the manufacture of powder, particularly the large-grained for heavy cannon, were instituted by my predecessor, and continued under my direction, at the Annapolis battery, in conjunction with the mills of the Messrs. Dupont, near Wilmington, Del. These have enabled us thus far to produce a powder which gives with substantial uniformity in the 15-inch a velocity of 1,800 feet, with a pressure of not more than 30,000 pounds per square inch upon the bore of the gun. These experiments have not only shown that the size of the grains should vary with the caliber, but have determined the limits of density, and have shown the importance of certain details in the manufacture hitherto neglected. This improvement upon the old manufacture may be understood from the fact that the samples of a lot of mammoth grain powder (5 barrels taken indiscriminately from 1,000) fired July 8, 1872, gave (in charges of 100 pounds) irregular velocities and pressures, respectively, of 1,468 feet by 31,000 pounds; 1,500 feet by 57,500 pounds; 1,504 feet by 43,500 pounds, &c.

The effect of such variable propelling forces and strains upon the ranges and endurance of cannon may be readily imagined. They are extremely prejudicial to guns of any kind, but particularly dangerous to the cast-iron ordnance of our Navy. Wherefore it may be said that their safety is insured proportionately with the uniformity attained in the action of the powder used in them; the object being high velocities and low pressures. The best results are obtained with grains of definite form, regular surface, and uniform density. A simple method of securing this, which I proposed, has been adopted. Charges made of these hexagonal grains, weighing 100 pounds, were fired from a 15-inch smooth-bore gun, on the 20th of August, 1872. They gave velocities and pressures, respectively, of 1,644 feet by 28,500 pounds; 1,635 feet by

32,500 pounds, and 1,611 feet by 32,000 pounds. In the solution of this important question a friendly rivalry is maintained by the Army authorities, an example of which is shown in the following extract from an official report just made, and kindly sent me by the Chief of Ordnance. In this instance a 12-inch cast-iron rifle was used in firing the hexagonal grains.

	Charge.	Weight of shot.	Pressures.	Velocities.
1	110 pounds	600	37,000	1,368
2	110 pounds	600	37,000	1,364
3	100 pounds	650	29,000	1,272
4	100 pounds	650	37,000	1,272
5	80 pounds	700	25,000	1,154
6	90 pounds	700	28,000	1,195
7	100 pounds	700	38,000	1,272

In connection with the work upon powder for large cannon, I have also instituted experiments with the finer grains for the metallic cartridges of small-arms. In these experiments are embraced the details relating to the development of a perfected system of ammunition for the breech-loading small-arms of the Navy, and to serve also for the Gatling guns, which now form part of the equipment. The failures experienced by our seamen and marines, under very trying circumstances, in the Corea, from defective ammunition, drew attention to the absolute necessity of having a cartridge upon the keeping-qualities of which, in the moist and heated atmosphere of a ship's hold in tropical climates, the utmost reliance could be placed.

To this end my predecessor, Admiral Case, directed a searching examination of the subject to be made without delay, and from various specimens of cartridges, selected the solid-head cases, made by the United States Cartridge Company, at Lowell, Mass., for trial; not only because they exhibited excellent workmanship, but that they seemed to have the best method of reloading, an essential element in naval small-arm ammunition. With the limited quantity required for naval purposes, this Bureau does not consider it expedient to set up machinery for its manufacture, but prefers to rely on the competition of private establishments. Therefore it detailed an officer to maintain a special supervision and inspection of the work in every stage of its progress, from the preparation of the sheets of metal to the finished cartridge, ready for service. This duty has been performed in the most satisfactory manner, the people of the factory aiding the Bureau with signal ability; and the success of these joint efforts was shown in some recent practice made from a Gatling gun, during which 100,000 of these cartridges, brass cases, with solid heads, containing 70 grains of powder and a bullet of 450 grains, were fired with the following results:

Failed to extract after the cartridge exploded	0
Burst heads	0
Failed to explode on first effort, and from all causes	46

In no instance was there an escape of gas in the rear.

During the whole of the trial the gun was not impeded by any failure of a cartridge. On the first day 4,000 cartridges were fired with extreme rapidity, in 15′ 8″; and on the second day, 60,000 in succession, without stopping to clean the gun. After the sixty thousandth round

no appreciable difference was observed in the working of the gun, nor in its ability to deliver its fire with certainty and satisfactory accuracy. Cartridge-cases which had been reloaded 100 times each were found to be in excellent condition.

It will be observed that the percentage of failures to explode is extremely small; and no heads were burst; nor did any cartridge fail to extract, which is the most important element in a metallic case required for use in both the rifle and Gatling gun.

THE GATLING GUN

Exhibited qualities of precision, rapidity of fire, and endurance exceedingly remarkable. So much has been said concerning these pieces that it would be idle to repeat the details. The general opinion among ordnance men is, that it will never entirely supplant the guns of light batteries, nor the boat-howitzers of the Navy. As an auxiliary, however, to the latter on board ship, and in dangerous boat operations, such as disembarking or embarking bodies of men in the face of an enemy, its value cannot be overestimated.

During the experiment at Annapolis, above recited, several modifications in the feed-drums, or cases, were suggested, by which the rapid delivery of the cartridges in firing might be facilitated. These will be supplied as soon as they can be made, and then tested in service.

In the artillery operations of the Franco-German war, breech-loading rifled field-pieces were used by the latter in all the battles which occurred; and there is little doubt of their having performed an important part in every engagement in which they were brought into play.

Whether, under similar circumstances, an equal number of muzzle-loaders, properly served, might not have done as well, is perhaps an open question. It is sufficiently obvious, however, that there are many advantages peculiar to breech-loaders which warrant their use in naval light artillery, as well as for heavy guns of a battery. Therefore the Bureau is now engaged in preparing for experimental firing two guns, both intended to use metallic cartridge-cases, which, in its judgment, are preferable for naval guns of small caliber. One of these is to be made after the designs of Mr. B. B. Hotchkiss, of New York, as a gun of the kind has already been subjected to trials in France with satisfactory results.

The advantage of using a cartridge-case lies in having a gas-check renewable at every round; and in the guns in question the arrangements of the breech for loading, closing, and extracting the empty cases are very simple.

TORPEDO STATION.

The report of examination of officers under instructions in torpedo service at Newport, made in compliance with the Department's orders, of date the 26th June, 1873, is hereto appended. It gives a very clear impression of the condition to which this particular branch of the ordnance service has been brought under the system inaugurated by my predecessor.

The necessity of maintaining this station, and utilizing it as a school in which officers may be trained in the details and exercises of torpedo warfare, needs no argument. It is, however, to be regretted that but one commanding officer has availed himself of its advantages, others being apparently content to take their instruction at second-hand from junior officers under their command. For this reason it has not reached all the development of which it is susceptible. Recent advices from

our ships composing the European fleet inform me that no difficulties are experienced in firing improvised torpedoes in rapid succession The items of appropriations for torpedo purposes are strictly observed in the expenditures.

The more pressing demands of the service, I regret to say, has caused the withdrawal of the Constellation from duty as the ordnance practice-ship.

The Department having discontinued the station of Mound City, Ill., all the ordnance property of any value has been transferred from thence to the navy-yard at Pensacola, where the improvements for ordnance purposes authorized by the act of May, 1872, are very nearly completed.

Finally, the Bureau is about to take the preliminary steps for the removal of the naval magazine in this city, as authorized and appropriated for by Congress at its last session.

The accompanying estimates have been carefully prepared and revised, and are believed to be as low as the necessities of the ordnance service will permit. I may remark, however, that whenever Congress may think proper to authorize the construction of heavy rifled-guns, and their equipment, the Bureau will be prepared with the necessary plans; and the inventive genius and mechanical skill of our people will doubtless be found sufficient for the task.

I have the honor to be, with high respect, your obedient servant,

WILLIAM N. JEFFERS,
Chief of Bureau.

Hon. GEORGE M. ROBESON,
Secretary of the Navy.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1875, by the Bureau of Ordnance, Navy Department.

Detailed objects of expenditure, and explanation.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
SALARIES.		
Chief clerk, per act of July 23, 1866, (14 Stat. at L., p. 207, sec. 8)	$1,800 00	
Draughtsman, per act of March 2, 1867, (14 Stat. at L., p. 450, sec. 1)	1,800 00	
One clerk of class three, per act of July 12, 1870	1,600 00	
Two clerks of class two, same act	2,800 00	
One messenger, per acts of July 5, 1862, (12 Stat. at L., p. 511, sec. 3, and March 3, 1869, 15 Stat. at L., p. 287, sec. 1)	840 00	
One laborer, per act of July 12, 1870	720 00	
Total	9,560 00	$9,560 00
CONTINGENT EXPENSES.		
Stationery, books, and miscellaneous items, appropriated, (17 Stat. at L., p. 502, sec. 1)	800 00	800 00
ORDNANCE AND ORDNANCE STORES.		
Fuel and materials necessary in carrying on the mechanical branches of the Ordnance Department of the several navy-yards, (appropriated, 17 Stat. at L., p. 548)	118,713 00	
Labor at navy-yards, (appropriated, 17 Stat. at L., p. 548)	306,838 00	
Repairs to ordnance buildings, magazines, gun-parks, machinery, &c., (appropriated, 17 Stat. at L., p. 549)	56,378 00	
Miscellaneous items, freights, &c., (appropriated, 17 Stat. at L., p. 549)	12,271 00	
Total	494,200 00	493,751 00

Estimates of appropriations required for the Bureau of Ordnance, &c.—Continued.

Detailed objects of expenditure, and explanation.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
IMPROVEMENTS, AS FOLLOWS, VIZ:		
Magazine, Norfolk:		
Shed on wharf for loading and unloading shell, (submitted)	$ 102 71	
Powder-boat, (submitted)	6,000 00	
Force and lift pump, (submitted)	42 00	
Total	6,144 71	$110,933 00
TORPEDO CORPS.		
Purchase and manufacture of gunpowder, nitro-glycerine, gun-cotton, &c., (appropriated, 17 Stat. at L., p. 549)	20,000 00	
Purchase and manufacture of electrical machines, galvanic batteries, and insulated wire, including the erection of a building for purposes of instruction in electricity, (appropriated, 17 Stat. at L., p. 549)	24,000 00	
Purchase of copper, iron, wood, and other materials necessary for the manufacture of torpedoes, with work on same, (appropriated, 17 Stat. at L., p. 549)	27,000 00	
Construction of torpedo-boats, purchase of coffer works or bulks, and contingent expenses, (appropriated, 17 Stat. at L., p. 549)	50,000 00	
Repairs to buildings and wharves, (17 Stat. at L., p. 549)	5,000 00	
Labor, including chemist, electrician, pyrotechnist, machinists, watchmen, &c., (appropriated, 17 Stat. at L., p. 549)	25,000 00	
Total	151,000 00	123,765 00
CIVIL ESTABLISHMENT.		
Pay of superintendents and the civil establishment at the several navy-yards under this Bureau, (appropriated, 17 Stat. at L., p. 549)	15,000 00	15,000 00
CONTINGENT.		
Contingent expenses of the ordnance service of the Navy, (appropriated, 17 Stat. at L., p. 549)	1,000 00	1,000 00

No. 7.

BUREAU OF MEDICINE AND SURGERY.

NAVY DEPARTMENT,
Bureau of Medicine and Surgery, November 1, 1873.

SIR: Herewith I have the honor to submit the report of the operations of this Bureau for the past year, with such suggestions as, in my opinion, are calculated to promote the efficiency of the medical service of the Navy.

NAVAL HOSPITALS.

During the summer the usual visit of inspection was made to several of the principal hospitals of the Navy, and to the United States Naval Laboratory, at Brooklyn.

The hospital at Portsmouth, N. H., stands within the navy-yard, and is an old and dilapidated building, in all respects inadequate to the purposes for which it is used. It should at once be demolished, and a suitable structure erected elsewhere. An advantageous site can be obtained beyond the limits of the yard, and a small though commodious hospital built at a moderate cost. For this object an appropriation of

$65,000 would be required. If, on examination, a good site could be found on ground now belonging to the Government, a somewhat smaller sum would suffice.

The Quarantine Hospital on Wood's Island, at the entrance to the harbor of Portsmouth, has been put in good order, at a cost of $2,000, and is now ready for the reception of the class of patients for whom it was designed. Being constructed on a mere ledge of rocks, its situation has been regarded as precarious; and though believed to be well secured by its present fastenings, it has once been nearly washed away, and the occurrence of an unusually heavy gale would excite solicitude for its safety. For this reason, if the preceding suggestion for the erection of a new hospital should be carried into effect, provision, at the same time, might be made, without much if any additional cost, for the construction of a quarantine building at a suitable distance from the former.

The hospital at Chelsea, Mass., having of late years had but little expended on it, except to meet demands of the most pressing kind, is now in want of considerable repairs; but it is not believed that any special appropriation will be needed for this purpose.

The hospital at New York is far from being in as good condition as could be desired. It is the most important establishment of the kind belonging to the Navy, and to maintain its efficiency will soon need general renovation and extensive repairs.

So little has been expended on the Norfolk hospital since its recovery by the Government that it has fallen into a dilapidated state, and is now in urgent need of repairs to preserve it from decay. A year ago a thorough inspection of the building and appendages having been made by a board composed largely of experts, the cost of the repairs found by them to be absolutely necessary was estimated by the civil engineer of the Norfolk navy-yard—himself a member of the board of inspectors—to amount to $32,649.55. Although it is not proposed to recommend the expenditure of so large a sum, this estimate by a practical man who had acquainted himself with the details of the work to be done, is mentioned here to show the actual condition of the establishment, as well as the pressing need of something being done for its preservation.

The hospital at Philadelphia requires no special appropriation, but can be kept in its present condition out of the resources ordinarily at the disposal of the Bureau.

I respectfully beg to renew a suggestion made by my predecessor, in his report of last year, that an appropriation of $50,800 is required to construct surgeon's quarters, drains, roads, water-pipes, &c., at the naval hospital, Mare Island, California.

The hospital at Pensacola, Fla., having been destroyed at the outset of the rebellion, the wants of the station since have been supplied, though to a very imperfect extent, by the use of a small wooden building hastily put up in the navy-yard during the war.

The building has long been felt as an inconvenience by the other departments of the yard, and on every account is unfit to be maintained any longer in its present position. Pensacola is necessarily a most important station in the Gulf of Mexico; and, from the preponderance of our national interests in the adjacent waters, may at any moment become of still greater importance. A commodious hospital is greatly needed at this point, and I therefore urgently recommend that immediate steps be taken for its erection. For this purpose the sum of $100,000 will be required.

The naval hospital at Yokohama, Japan, being constructed of perishable materials, constantly calls for repairs.

Its enlargement will also soon become a matter of prime necessity. Being designed for the reception of merchant as well as naval seamen, our increasing commercial interests in those seas will not much longer be satisfied with the accommodations it now affords. To meet present, and provide for future wants, the small sum of $5,000 will be required.

Last year the sum of $25,000 was appropriated by Congress for "repairs and improvements of hospitals;" but my own observation, supplemented by the experience of medical officers in charge, convinces me that it was much too small. The sum now estimated for this purpose, though an increase on that of last year, will only be sufficient to execute necessary repairs, and to place these receptacles for the sick and wounded of the Navy on a respectable footing.

Without the least extravagance in fitting up, it is gratifying to know that most of the naval hospitals are now reasonably well provided with appliances for the care and comfort of the sick, so that no unusual expenditure will be required on this head. It is true the grounds and cemeteries of all of them would be improved by an increased expenditure at each, but although in this respect they are far behind our civil establishments, I do not propose applying to this end the money so imperatively needed for objects of greater importance.

NAVAL HOSPITAL FUND.

The financial condition of the Bureau demands, as I no doubt it will receive, your earnest consideration.

The naval-hospital fund, on which dependence is placed for the maintenance of hospitals, is nearly exhausted. The annexed table, marked C, explains its condition. While on October 1, 1872, it amounted to $73,910.04, on October 1, 1873, it had declined to $18,663.35. The difference, $55,246.69, represents the drafts, in excess of newly accruing credits, made on the fund last year for the support of hospitals. As the average annual disbursement for this object during the years 1869–'70–71–'72 was $127,913.95, to maintain the same unavoidable scale of expenditure, an appropriation will hereafter become necessary. To make up this deficiency for the remainder of the present fiscal year, $50,000 will be required, and for next year $100,000.

A few words of explanation will show why the fund has become so greatly reduced. On the 1st of January, 1869, the naval-hospital fund amounted to the large sum of $421,044.12. This, with additions regularly made to it from year to year, under the act of February 26, 1811, would long have been ample for the support of hospitals. During the years 1869, 1870, 1871, 1872, the sum of $217,852.80, belonging to the fund, was applied to the construction of the hospitals at Mare Island and Annapolis. Add to this the amount taken out of it annually for ordinary hospital purposes, and it will be seen that its exhaustion was necessarily only the work of a few years.

MEDICAL CORPS.

The present condition of the medical corps of the Navy is well calculated to excite uneasiness as to its future. There are now thirty vacancies in the grade of assistant surgeons, and resignations are still pending. Already the Bureau finds considerable embarrassment in procuring medical officers for the duty to be performed. But few candidates for admission present themselves before the medical board, and of these not more than one-fourth are found qualified for a commission. This result

is not owing to any unusual strictness in the examinations, but to the want of the necessary qualifications on the part of candidates. The proof of this is seen in the written portions of the examination, which the rules of the Department wisely require to be lodged with the Bureau. While it is far from being assumed that boards are infallible, a perusal of this work in most instances carries with it convincing vindication of the soundness of their judgment. The facilities for obtaining medical degrees are so great that the possession of a diploma is no longer, *per se*, an evidence of merit. Hence the duty devolves on the board to exercise great vigilance in scrutinizing the pretensions of those coming before it. Then, too, the emphatic words of the Department, announcing that "the health and lives of the officers and men of the Navy are objects too important to be intrusted to ignorant or incompetent persons," are a continual reminder to the board "not to report favorably upon any case admitting of a reasonable doubt." An obvious reason exists why assistant surgeons in the Navy should possess high qualifications, even higher than medical men practicing on shore. In difficult cases the latter has the privilege of consulting with older and more experienced practitioners, while the former is often left to depend on his own resources alone.

The experience of naval medical boards shows that, although a candidate may not always come up to the established standard, yet he may give such proofs of general aptitude that his failure is obviously more due to want of opportunity than of capacity. If this omission could in any way be supplied, a valuable and much needed acquisition might be secured to the Navy.

This leads me to speak of a want which is beginning to make itself seriously felt throughout the service, viz, of a school of instruction, under the control of the Department, for candidates of the description mentioned, as well as for assistant surgeons preparing for their second examination. The course of instruction would be for a limited period, and should be conducted under the guidance of medical officers of the Navy. The proper place for such a school would be at New York or Philadelphia, where there are large naval and civil hospitals, with museums and facilities for the study of practical anatomy.

England, with all her educational advantages, finds military service so peculiar in its demands on medical men, that at Netley she has laid the foundations of a school through which, hereafter, her army and navy surgeons must pass. A school on a much more moderate scale would suffice for the present wants of our service.

NAVAL LABORATORY.

During the past year the naval laboratory at New York, under its present excellent management, has furnished the Navy with a full stock of the best medicines. In this respect there is little left to be desired. The opportunity which the laboratory would afford of acquiring a practical knowledge of pharmacy, and, to a more limited extent, of chemistry, is an additional reason why the proposed school should be established in New York.

BUREAU PUBLICATIONS.

The publications of the Bureau during the year comprise two volumes of medical and surgical essays; and, though on a modest scale, these have been extensively sought after, and are believed to possess considerable

intrinsic value. In addition to these, the Bureau has in course of preparation a comprehensive medical and surgical work, which, when completed, will place within the reach of the profession an amount of valuable information now buried in journals and reports, which hitherto have never seen the light. When the manuscript is ready for the press, a small appropriation will be required to defray the expenses of publication. As the fruits of our enlarged experience during the war can thus be made available to the world at large, it is not doubted that the liberality which, in similar instances, has characterized the action of Congress, will sanction this new contribution to humanity and science.

Respectfully submitted.

J. BEALE,
Chief of Bureau.

A.—*Statement of sick, compiled from reports of sick from the naval stations in the United States, and from vessels in commission on home and foreign stations, for the year ending December* 31, 1872.

Hospitals.	Remaining sick December 31, 1871.	Admitted in 1872.	Discharged in 1872.	Died in 1872.	Total treated in 1872.	Remaining sick December 31, 1872.	Percentage of deaths to whole number of cases treated.
Chelsea, Mass	38	146	151	11	184	22	
Brooklyn, N. Y	52	220	193	11	272	68	
Philadelphia, Pa	32	257	230	16	289	43	
Annapolis, Md	6	21	21	.....	27	6	
Washington, D. C	16	114	109	5	130	16	
Norfolk, Va	10	128	98	8	138	32	
Pensacola, Fla	6	94	87	7	100	6	
Mare Island, Cal	52	131	137	2	183	44	
Yokohama, Japan	....	26	18	2	26	6	
	212	1,137	1,044	62	1,349	243	.004

Navy-yards and stations.	Remaining sick December 31, 1871.	Admitted in 1872.	Discharged in 1872.	Died in 1872.	Total treated in 1872.	Remaining sick December 31, 1872.	Percentage of deaths to whole number of cases treated.
Portsmouth, N. H	5	233	231	4	238	3	
Boston, Mass	7	242	242	1	249	6	
Brooklyn, N. Y	5	210	205	.....	215	10	
Philadelphia, Pa	7	227	228	2	234	4	
Washington, D. C	4	412	465	4	416	7	
Norfolk, Va	5	229	230	.....	234	4	
Pensacola, Fla	1	7	8	.....	8	.....	
Mound City, Ill	.....	24	23	.....	24	1	
Mare Island, Cal	9	98	102	1	107	4	
League Island, Pa	2	61	61	1	63	1	
Torpedo Station, Newport	.....	39	39	.....	39	.....	
Naval Academy	10	841	837	4	851	10	
	55	2,623	2,611	17	2,678	50	.006

Receiving ships.	Average number on board in 1872.	Remaining sick December 31, 1871.	Admitted in 1872.	Discharged in 1872.	Died in 1872.	Total treated in 1872.	Remaining sick December 31, 1872.	Percentage of deaths to whole number of cases treated.
Portsmouth N. H	121	1	79	79	.....	80	1	
Boston, Mass	216	9	218	223	1	227	3	
Brooklyn, N. Y	411	6	223	211	.....	229	18	
Philadelphia, Pa	147	4	99	96	1	103	6	
Norfolk, Va	115	.....	100	95	3	100	2	
Mare Island, Cal	125	.....	87	85	2	87	.....	
	1,135	20	806	789	7	826	30	.008

RECAPITULATION.

	Aggregate number of officers and men on board vessels in 1872.	Remaining sick December 31, 1871.	Admitted in 1872.	Discharged in 1872.	Died in 1872.	Total treated in 1872.	Remaining sick December 31, 1872.	Percentage of cases to number of persons on board.	Percentage of deaths to number of persons on board.	Percentage of deaths to number of persons treated.
Hospitals	.....	212	1,137	1,044	62	1,349	243	.....	.....	.046
Navy-yards and stations	.....	55	2,623	2,611	17	2,678	50	.....	.....	.006
Receiving-ships	1,135	20	806	789	7	826	30	.72	.006	.008
Vessels in commission at sea	11,570	229	8,978	8,891	61	9,207	255	.79	.005	.006
Total	12,705	516	13,544	13,335	147	14,060	578	1.01	.01	.01

Summary of vessels in commission.

Average number on board during the year 1872	11,570
Remaining sick December 31, 1871	229
Admitted in 1872	8,978
Discharged in 1872	8,891
Died in 1872	61
Total treated in 1872	9,207
Remaining sick December 31, 1872	255
Percentage of cases to whole number of persons on board	1.01
Percentage of deaths to whole number of persons on board	.01
Percentage of deaths to number of persons treated	.01

At the close of the year 1871 there remained under treatment 516 cases; during the year 1872 there occurred 13,544 cases of disease, injury, &c., making a total of 14,060 cases treated during the year; of which number 147 died, 13,335 were returned to duty or discharged the service, leaving 578 cases under treatment at the close of the year 1872.

The average strength of the Navy (officers, seamen, marines, engineer service, and coast survey included) for the year 1872, as near as can be ascertained, was about 12,705.

The proportion of cases admitted to the whole number of persons in the service was about 1.01, or each person was on the sick-list $1\frac{1}{100}$ times during the year. The percentage of deaths to the whole number in the service was .01, and the percentage of deaths to the whole number of cases was .01.

The total number of deaths from all causes reported at the Navy Department from October 1, 1872, to September 30, 1873, was 330.

B.—*Summary of prevalent forms of disease on home and foreign service for the year ending December* 31, 1872.

	North Atlantic.	South Atlantic.	European.	Pacific.	Asiatic.	Special service.	School and practice.	Coast survey.	Total.
Aggregate number of men	2,211	1,054	2,252	2 544	2,600	608	202	99	11,57
Febrile diseases:									
Cases treated	496	75	127	258	174	49	6	10	1,195
Deaths	3	.....	5	3	1	.....	.....	.....	12
Diseases of the digestive system:									
Cases treated	250	217	208	273	355	78	28	63	1,472
Deaths	.....	.....	2	.....	7	.....	.....	.....	9
Diseases of the respiratory system:									
Cases treated	152	116	233	230	152	83	24	30	1,020
Deaths	11	3	1	.....	2	1	.....	.....	18
Diseases of the circulatory system:									
Cases treated	28	9	33	44	42	2	1	6	165
Deaths	1	.....	2	2	1	.....	.....	.....	6
Diseases of the brain and nervous system:									
Cases treated	83	39	64	128	88	16	9	13	440
Deaths	1	1	.....	2	.....	.....	.....	.....	4
Diseases of the cutaneous and cellular system:									
Cases treated	162	100	193	337	231	40	9	20	1,092
Deaths	1	.....	.....	.....	.....	.....	.....	.....	1
Diseases of the fibrous, osseous, and muscular system:									
Cases treated	183	59	164	176	170	42	12	14	820
Deaths	.....	.....	2	.....	1	.....	.....	.....	3
Diseases of the serous and absorbent system:									
Cases treated	2	1	13	.....	.....	.....	.....	.....	16
Deaths	1	.....	.....	.....	.....	.....	.....	.....	1
Diseases of the genito-urinary system:									
Cases treated	86	89	214	296	349	35	16	27	1,112
Deaths	.....	.....	.....	.....	.....	.....	.....	.....	.....
Malignant diseases:									
Cases treated	35	7	9	25	29	3	1	.....	109
Deaths	1	.....	.....	.....	.....	.....	.....	.....	1
Diseases of the eye and ear:									
Cases treated	27	20	37	41	34	9	.....	3	171
Deaths	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wounds and injuries:									
Cases treated	288	223	308	382	232	109	37	16	1,595
Deaths	.....	.....	3	3	.....	.....	.....	.....	6
Total cases treated	1,792	955	1,603	2,190	1,856	466	143	202	9,207
Total deaths	19	4	15	10	12	1	.....	.....	61

C.—*Naval-hospital fund.*

The condition of this fund is represented as follows:

Balance on hand October 1, 1872	$73,910 04
Transferred to the fund by the Fourth Auditor, in settlement of accounts, &c., from October 1, 1872, to October 1, 1873	72,954 43
Transferred to the fund on account of supplies from the naval laboratory to vessels and navy-yards, from October 1, 1872, to October 1, 1873	7,585 10
Total	154,449 57
Deduct amount expended from October 1, 1872, to October 1, 1873	135,786 22
Balance on hand October 1, 1873	18,663 35

D.—*Insane of the Navy.*

On the 30th September, 1873, there remained under treatment in the Government Hospital for the Insane, near this city, 3 officers, 1 late ensign, 7 marines, 10 seamen, 4 landsmen, 1 coal-heaver, 1 late first-class boy, (white,) 1 late first-class boy, (colored,) 3 beneficiaries, and 1 late seaman—total 32
Admitted during the year ending September 30, 1873: 4 landsmen, 5 marines, 1 ordinary seaman, 1 ordinary seaman ex, 1 late ordinary seaman—total 12

Total number under treatment during the year 44
The discharges in the course of the year were: 6 landsmen, 2 marines, 1 seaman, 1 late first-class boy, (white,) 1 ordinary seaman, 1 beneficiary—total 12

Leaving in the institution on the 30th September, 1873: 3 officers, 1 late ensign, 9 seamen, 1 ordinary seaman ex, 2 landsmen, 10 marines, 1 coal-heaver, 1 late first-class boy, (colored,) 2 beneficiaries, 1 late seaman, 1 late ordinary seaman—total 32

Estimates of appropriations required for the service of the fiscal year ending June 30, 1875, by the Bureau of Medicine and Surgery.

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
SALARIES.		
One clerk of class four, per act of July 23, 1866, (14 Stat. at L., p. 208, sec. 8)	$1,800 00	.....
One clerk of class three, per act of July 23, 1866, (14 Stat. at L., p. 208, sec. 8)	1,600 00	.....
One messenger, per acts of July 5, 1862, (12 Stat. at L., p. 511, sec. 3,) and July 12, 1870, (16 Stat. at L., p. 250, sec. 3)	840 00	.....
One laborer, per act of July 12, 1870, (16 Stat. at L., p. 493, sec. 1)	720 00	.....
	4,960 00	$4,960 00
CONTINGENT EXPENSES.		
Stationery and miscellaneous items; (appropriated, 17 Stat. at L., p.502, sec. 1)	600 00	400 00
REPAIRS AND IMPROVEMENTS OF HOSPITALS.		
Repairs to naval laboratory, naval hospitals and appendages, including roads, wharves, outhouses, sidewalks, fences, gardens, farms, cemeteries, steam-heating apparatus, furniture, head-marks for graves in cemeteries, &c.; (appropriated, 17 Stat. at L., p. 551, sec. 1)	50,200 00	25,000 00
SURGEONS' NECESSARIES AND APPLIANCES.		
Support of the medical department of vessels in commission, navy-yards, naval stations, Marine Corps, and Coast Survey; (appropriated, 17 Stat. at L., p. 551, sec. 1)	40,000 00	40,000 00
CIVIL ESTABLISHMENT.		
At the hospital, Chelsea, Mass.:		
1 purveyor, at $750; 1 apothecary, at $480; 1 chief cook, at $240; (appropriated, 17 Stat. at L., p. 551, sec. 11)	$1,470 00	
1 second cook, at $168; 3 bay-men, at $240 each; 3 washers, at $160 each; (appropriated, 17 Stat. at L., p. 551, sec. 1.)	1,392 00	
4 watchmen, at $360 each; 2 laborers, at $240 each; 1 engineer, at $600; (appropriated, 17 Stat. at L., p. 551, sec. 1)	2,520 00	
2 firemen, at $360 each; 1 gardener, at $300; 1 farmer, at $480; (appropriated, 17 Stat. at L., p. 551, sec. 1)	1,500 00	
1 messenger, at $240; 1 gate-keeper, at $300; 1 matron, at $360; (appropriated, 17 Stat. at L., p. 551, sec. 1)	900 00	
	7,782 00	7,782 00

Estimates of appropriations, &c.—Continued.

Detailed objects of expenditure and explanations.		Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
At the hospital, New York:			
1 purveyor, at $750; 1 apothecary, at $750; 1 carpenter, at $720; (appropriated, 17 Stat. at L., p. 551, sec. 1)	$2,220 00		
1 chief cook, at $300; 2 cooks, at $180 each; 4 bay-men, at $240 each; (appropriated, 17 Stat. at L., p. 551, sec. 1)	1,620 00		
2 washers and 2 chambermaids, at $168 each; 1 master-at-arms, (policeman,) at $420; (appropriated, 17 Stat. at L., p. 551, sec. 1)	1,092 00		
2 watchmen, at $300 each; 3 laborers, at $240 each; 2 mess-men, 1 at $240 and 1 at $216; (appropriated, 17 Stat. at L., 551, sec. 1)	1,776 00		
1 engineer, at $720; 3 firemen, at $360 each; 1 painter and glazier, and 1 gardener, at $480 each; (appropriated, 17 Stat, at L., p. 551, sec. 1)	2,760 00		
1 ambulance-driver and 1 messenger, at $420 each; 1 matron, at $420; (appropriated, 17 Stat. at L., p. 551, sec. 1)	1,260 00		
2 gate-keepers, 1 at main gate, at $360, and 1 at rear gate, at $240; (appropriated, 17 Stat. at L., p. 551, sec. 1)	600 00		
		$11,328 00	$11,332 00
At the hospital, Philadelphia, Pa.:			
1 purveyor, at $750; 1 apothecary, at $480; 1 carpenter, at $480; 1 chief cook, at $240; (apppropriated, 17 Stat. at L., p. 551, sec. 1)	1,950 00		
1 cook, at $168; 3 bay-men, at $240 each; 3 washers and 1 scrubber, at $168 each; (appropriated, 17 Stat. at L., p. 551, sec. 1)	1,560 00		
1 master-at-arms, at $420; 2 laborers, at $240 each; 1 mess-room attendant, at $240; (appropriated, 17 Stat. at L., p. 551, sec. 1)	1,140 00		
1 engine-tender, at $600; 2 firemen, at $360 each; 1 gardener, at $300; (appropriated, 17 Stat. at L., p. 551, sec. 1)	1,620 00		
1 ambulance-driver, at $240; 1 messenger, at $240; 1 matron, at $240; (appropriated, 17 Stat. at L., p. 351, sec. 1)	720 00		
		6,990 00	6,990 00
At the hospital, Annapolis, Md.:			
1 purveyor, at $750; 1 chief cook, at $210; 1 cook, at $168; (appropriated, 17 Stat. at L., p. 551, sec. 1)	1,128 00		
2 bay-men and 1 laborer, at $168 each; 1 watchman, at $360; 1 washer, at $180; (appropriated, 17 Stat. at L., p. 551, sec. 1)	944 00		
1 engine-tender, at $600; 2 firemen, at $360 each; 1 gardener, at $300; (appropriated, 17 Stat. at L., p. 551, sec. 1)	1,620 00		
1 ambulance-driver, 1 messenger, and 1 matron, at $240 each; (appropriated, 17 Stat. at L., p. 551, sec. 1)	720 00		
		4,512 00	4,512 00
At the hospital, Washington, D. C.:			
1 purveyor, at $750; 1 apothecary, at $480; 1 chief cook, at $240; 2 cooks, at $168 each; (appropriated, 17 Stat. at L., p.551, sec. 1)	1,806 00		
3 bay-men, at $240 each; 3 washers and 2 laborers, at $144 each; 1 watchman, at $420; (appropriated, 17 Stat. at L., p.551, sec. 1)	1,860 00		
2 firemen, 1 at $420 and 1 at $360; 1 ambulance-driver, at $300; 1 messenger, at $180; (appropriated, 17 Stat. at L., p. 551, sec. 1)	1,260 00		
		4,926 00	4,926 00
At the hospital, Norfolk, Va.:			
1 purveyor, at $750; 1 apothecary, at $480; 1 chief cook, at $300; 1 cook, at $240; (appropriated, 17 Stat. at L., p. 552, sec. 1)	1,770 00		
4 bay-men, 1 at $240, and 3 at $168 each; 1 watchman, at $300; 3 laborers, at $192 each; (appropriated, 17 Stat. at L., p.552, sec. 1)	1,620 00		
2 washers, at $144 each; 1 engineer, at $720; 2 mess-room attendants, at $168 each; (appropriated, 17 Stat. at L., p. 552, sec. 1)	1,344 00		
4 boatmen, at $168 each; (appropriated, 17 Stat. at L., p.552, sec. 1)	672 00		
		5,406 00	5,406 00
At the hospital, Pensacola, Fla.:			
1 purveyor, at $750; 1 apothecary, at $480; 1 chief cook, at $240; 1 cook, at $216; (appropriated, 17 Stat. at L., p. 552, sec. 1)	1,686 00		
4 bay-men, at $264 each; 4 bay-men, at $216 each; 1 watchman, at $216; (appropriated, 17 Stat. at L., p. 552, sec. 1)	2,136 00		
3 laborers and 1 messenger, at $144 each; 2 washers, at $180 each; (appropriated, 17 Stat. at L., p. 552, sec. 1)	936 00		
2 mess-room attendants, at $168 each; (appropriated, 17 Stat. at L., p. 552, sec. 1)	336 00		
		5,094 00	5,094 00
At the hospital, Mare Island, Cal.:			
1 purveyor, at $1,000; 1 chief cook, at $540; 1 cook, at $480; (17 Stat. at L., p. 552, sec. 1)	2,020 00		
4 bay-men and 4 washers, at $480 each; 1 watchman and 2 laborers, at $360 each; (appropriated, 17 Stat. at L., p. 552, sec. 1)	49 20		
mess-room attendants, at $216 each; 1 engineer, at $1,000; 1 fireman, at $500; (appropriated, 17 Stat. at L., p. 552, sec. 1)	1,932 00		
		8,872 00	8,872 00

Estimates of appropriations, &c.—Continued.

Detailed objects of expenditure and explanations.		Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
At the hospital, Yokohama, Japan:			
1 apothecary, at $750; 1 chief cook, at $360; 1 cook, at $144; 2 bay-men, at $216 each; (appropriated, 17 Stat. at L., p. 552, sec. 1)	$1,686 00		
1 watchman, at $240; 1 gardener, at $120; 1 messenger, at $192; 4 laborers, at $60 each; (appropriated, 17 Stat. at L., p. 552, sec. 1)	792 00		
		$2,478 00	$2,478 00
At the naval laboratory, New York:			
1 manufacturer, 1 clerk, and 1 carpenter, at $800 each; 1 engineer, at $800; (appropriated, 17 Stat. at L., p. 552, sec. 1)	3,200 00		
1 chief packer, at $800; 1 shipping porter, at $500; 1 fireman and 1 porter, at $350 each; (appropriated, 17 Stat. at L., p. 552, sec. 1)	2,000 00		
1 assistant manufacturer and 3 assistant packers, at $300 each; (appropriated, 17 Stat. at L., p. 552, sec. 1)	1,200 00		
		6,400 00	6,400 00
At the navy-yard, Portsmouth, N. H.:			
1 apothecary, at $750; 1 nurse, at $180; 1 laborer and 1 cook, at $180 each; (appropriated, 17 Stat. at L., p. 552, sec. 1)		1,290 00	1,290 00
At the navy-yard, Boston, Mass.:			
1 apothecary, at $750; 1 laborer, at $2 per day, $730; (appropriated, 17 Stat. at L., p. 552, sec. 1)		1,480 00	1,480 00
At the navy-yard, New York:			
1 apothecary, at $750; 1 laborer, at $2 per day, $730; (appropriated, 17 Stat. at L., p. 552, sec. 1)		1,480 00	1,480 00
At the navy-yard, Philadelphia, Pa.:			
1 apothecary, at $750; 1 laborer, at $2 per day, $730; (appropriated, 17 Stat. at L., p. 552, sec. 1)		1,480 00	1,480 00
At the navy-yard, Washington, D. C.:			
1 apothecary, at $750; 1 laborer, at $2 per day, $730; (appropriated, 17 Stat. at L., p. 552, sec. 1)		1,480 00	1,480 00
At the navy-yard, Norfolk, Va.:			
1 apothecary; at $750; 1 laborer, at $2 per day, $730; (appropriated, 17 Stat. at L., p. 552, sec. 1)		1,480 00	1,480 00
At the Naval Academy, Annapolis, Md.:			
1 apothecary, $750; 1 nurse, $180; 1 cook, $168; 1 laborer, $144; (appropriated, 17 Stat. at L., p. 552, sec. 1)		1,242 00	1,242 00
At the naval station, Mound City, Ill.:			
1 apothecary, at $750; 1 laborer, at $2 per day, $730; (appropriated, 17 Stat. at L., p. 552, sec. 1)		1,480 00	1,480 00
		75,200 00	75,204 00
CONTINGENT.			
For contingent expenses of the Bureau; for freight on medical stores; transportation of insane patients; advertising; telegraphing; purchase of books; expenses attending naval medical examining boards; purchase and repair of wagons and harness; purchase of cows and horses, and feed for same; purchase of trees, seeds, garden tools, and fuel; subscription to necessary periodicals, &c.; (appropriated, 17 Stat. at L., p. 552, sec. 1)		25,000 00	25,000 00
RECAPITULATION.			
Salaries, &c		$5,560 00	$5,360 00
Repairs and improvements of hospitals		50,200 00	25,000 00
Surgeons' necessaries and appliances		40,000 00	40,000 00
Civil establishment		75,200 00	75,204 00
Contingent		25,000 00	25,000 00
		195,960 00	170,564 00

J. BEALE,
Surgeon-General United States Navy.

No. 8.

BUREAU OF PROVISIONS AND CLOTHING.

BUREAU OF PROVISIONS AND CLOTHING,
November 3, 1873.

SIR: I have the honor to submit herewith estimates marked A, B, C, D, and E, and schedules marked F, G, H, I, and K, for the fiscal year ending June 30, 1875.

I am, very respectfully, your obedient servant,

JAS. H. WATMOUGH,
Acting Paymaster-General, U. S. N.

Hon. GEO. M. ROBESON,
Secretary of the Navy.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1875, *by the Bureau of Provisions and Clothing.*

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
A.—EXPENSES OF THE BUREAU OF PROVISIONS AND CLOTHING.		
For salary of chief clerk, per act of July 5 1862, (12 Stat. at L., p. 511, sec. 3)	$1,800 00	.....
For salary of one clerk of class four, per act of July 23, 1866, (14 Stat. at L., p. 208, sec. 2)	1,800 00	.....
For salary of three clerks of class three, per act of July 23, 1866, (14 Stat. at L., p. 208, sec. 8)	*4,800 00	.....
For salary of two clerks of class two, per act of July 23, 1866, (14 Stat. at L., p. 208, sec. 8)	2,800 00	.....
For salary of three clerks of class one, per act of July 23, 1866, (14 Stat. at L., p. 208, sec. 8)	3,600 00	.....
For salary of messenger, per act of July 5, 1862, (12 Stat. at L., p. 511, sec. 3)	840 00	.....
For salary of one laborer, per act of July 12, 1870, (16 Stat. at L., p. 250, sec. 3)	720 00	.....
	16,360 00	$14,760 00
B.—CONTINGENT EXPENSES OF THE BUREAU.		
For blank-books, stationery, and miscellaneous items; (appropriated, Stat. at L., pamphlet edition, p. 502, sec. 1)	800 00	800 00
C.—PROVISIONS FOR THE NAVY.		
For provisions for the officers, seamen, and marines; viz., 8,500 men, 900 commissioned officers, and 1,200 marine officers and privates; (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	1,547,600 00	.....
For the purchase of water for ships; (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	40,000 00	.....
	1,587,600 00	1,587,600 00
D.—CIVIL ESTABLISHMENT, BUREAU OF PROVISIONS AND CLOTHING, AT THE SEVERAL NAVY-YARDS.		
At navy-yard, Boston, one writer to paymaster; (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	1,017 25	.....
At navy-yard, Boston, one writer to inspector of provisions and clothing, (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	1,017 25	.....
At navy-yard, New York, one writer to inspector, (in lieu of an assistant in-		

* The estimate for an additional clerk of class three (allowed by act of July 23, 1866, but not heretofore required) is submitted on account of the Department's order of July 21, 1873, requiring the accounts of all pay officers to be settled quarterly instead of at the end of a cruise.

Estimates of appropriations, &c.—Continued.

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
spector, at $1,878;) appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	$1,252 00	
At navy-yard, New York, one writer to inspector, (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	1,017 25	
At navy-yard, New York, two writers to paymaster, at $1,017.25; (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	2,034 50	
At navy-yard, New York, assistant superintendent of mills, (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	1,095 50	
At navy-yard, Philadelphia, one writer to paymaster, (appropriated, Stat. at L., pamphlet edition, p. 552, sec.1)	1,017 25	
At navy-yard, Philadelphia, one writer to inspector, (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	1,017 25	
At navy-yard, Washington, one writer to paymaster, (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	1,017 25	
At navy-yard, Norfolk, one writer to paymaster, (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	1,017 25	
At navy-yard, Mare Island, one writer to paymaster, (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	1,017 25	
At navy-yard, Mare Island, one writer to inspector, (appropriated, Stat. at L., pamphlet edition, p. 552, sec. 1)	1,295 50	
	13,815 50	$14,285 00
E.—Contingent expenses of the Navy under Bureau of Provisions and Clothing.		
For freight and transportation to foreign and home stations; for candles; for fuel; for interior alterations and fixtures in inspection buildings; for tools, and repairing same at eight inspections; for special watchmen in eight inspections; for books and blanks; for stationery; for telegrams, postages, and express charges; for tolls, ferriages, and car-tickets; for ice; and for incidental labor not chargeable to other appropriations; (appropriated, Stat. at L., pamphlet edition, p. 553, sec. 1)	75,000 00	75,000 00

F.—*Schedule of proposals for clothing and clothing-materials received under advertisement dated October* 19, 1872.

Name.	Residence.	6,000 pairs blue cloth trowsers.	Blue flannel.		5,000 pairs calf shoes.	5,000 pairs kip shoes.	Mattresses, with two covers each.			15,000 yards linen sheeting.
			40,000 yards for New York.	15,000 yards for Mare Island.			3,000 for New York.	1,000 for Philadelphia.	1,000 for Boston.	
		Per pair	*Per yard.*	*Per yard.*	*Per pair*	*Per pair*	*Each.*	*Each.*	*Each.*	
Clark Woolen Company	New York, N. Y	.....	$0 72½	$0 82½	.....	.....	.....	.....	.....	.....
William McKnight	Philadelphia, Pa	.....	.....	.....	*$2 55	*$2 29	.....	.....	.....	.....
J. H. Howard	New York, N. Y	.....	75	.....	.....	.....	$6 73	$6 73	$6 73	.....
David Lamb & Co	do	.....	.....	.....	.....	.....	.....	.....	.....	$0 89 2-5
J. W. McKnight	Washington, D. C	.....	.....	.....	.....	.....	6 95	6 95	6 95	.....
David C. Mayne	Camden, N. J	.....	.....	.....	2 69	2 36	.....	.....	.....	.....
Isaac C. Noe	New York, N. Y	$6 86	.....	.....	.....	.....	8 50	8 50	8 50	.....
Noblit, Brown, Noblit & Co	Philadelphia, Pa	.....	.....	.....	.....	.....	7 60	7 60	7 60	.....
John G. Flagg †	Boston, Mass	.....	.....	.....	.....	.....	6 22	6 22	6 22	.....
J. Symington	New York, N. Y	.....	.....	.....	.....	.....	.....	.....	.....	98 86-100
John H. Wilcox	do	.....	.....	.....	.....	.....	7 34	7 38	7 36	1 14½
C. L. Fowle †	Boston, Mass	.....	.....	.....	.....	.....	*6 57	*6 57	*6 57	.....
H. T. Champney	do	.....	.....	.....	.....	.....	6 90	6 90	6 90	.....
Cooper & Hall	Philadelphia, Pa	.....	.....	.....	.....	.....	7 50	7 50	7 30	.....
J. Freeman & Co	Orange, N. J	.....	.....	.....	2 59	2 49	.....	.....	.....	.....
John Thompson	Philadelphia, Pa	.....	.....	.....	.....	.....	7 35	7 35	7 35	.....
S. C. Carll	do	.....	.....	.....	.....	.....	6 93	6 93	6 93	.....
John Mundell	do	.....	.....	.....	2 68	2 35	.....	.....	.....	.....
A. L. Haskell & Son	Boston, Mass	.....	88½	.....	.....	.....	6 73	6 73	6 73	.....
Mission and Pacific Woolen Mills	San Francisco, Cal	*6 12½	*56½	*56½	.....	.....	.....	.....	.....	.....
William Mathews	New York, N. Y	6 57	73 1-5	85	.....	.....	.....	.....	.....	*82 7-10
Lindenburger & Burke	San Francisco, Cal	.....	.....	59 99-100	.....	.....	.....	.....	.....	.....

*Contract awarded.

† J. G. Flagg and C. L. Fowle declining to make contract, it was awarded to A. L. Haskell & Son, at $6.57.

G.—*Schedule of proposals for blankets received under advertisement dated April* 2, 1873.

Name.	Residence.	4,000 pairs for New York.	1,000 pairs for Mare Island.
		Per pair.	*Per pair.*
William Mathews	New York	$5 97	$5 97
W. M. Betts	do	6 73	6 73
John Dobson*	Philadelphia	5 85	6 18
Lindenburger & Burke	San Francisco		6 75
Donald McLennan	do	7 62	7 62

* Contract awarded.

H.—*Schedule of proposals for pickles received under advertisement dated August* 10, 1872.

Name.	Residence.	175,000 ponnds for New York.	25,000 pounds for Boston.
		Per pound.	*Per pound.*
Skilton, Foote & Co	Boston	$0. 0950	$0. 0925
William Mathews	New York	.1030	.1030
J. A. Oakes & Co*	do	.0875	.0875
W. K. Lewis & Bros	Boston	.0894	.0894

* Contract awarded.

I.—*Schedule of proposals for fresh beef and vegetables received during the fiscal year ending June* 30, 1873.

Name.	Date of advertisement.	Where to be delivered.	Beef.	Vegetables.
			Per pound.	*Per pound.*
Hobbs & Wilson*	July 6, 1872	Boston, Mass	$0. 07	$0. 00375
Cyrus Flanders	July 6, 1872	do	.0625	.015
George H. Spaulding	July 6, 1872	do	.0725	.01
Mosser & Co	Dec. 2, 1872	New York, N. Y	.087	.02
William H. Kimberly	Dec. 2, 1872	do	.1098	.0225
J. W. Irving	Dec. 2, 1872	do	.07	.04
Peter Dempsey	Dec. 2, 1872	do	.135	.025
Patrick Morrison	Dec. 2, 1872	do	.097	.02
J. J. Lyons	Dec. 2, 1872	do	.082	.0125
John Hanley*	Dec. 2, 1872	do	.0721	.0119
Patrick Morrison	June 14, 1873	do	.155	.0475
Moses Strauss	June 14, 1873	do	.1545	.045
George Buddle	June 14, 1873	do	.145	.054
William McArdle	June 14, 1873	do	.145	.045
John Hanley*	June 14, 1873	do	.13875	.03875
L. S. Boraef*	June 14, 1873	Philadelphia, Pa	.15625	.0575
W. P. Corney	June 14, 1873	do	.16	.065
Cyrus Flanders	June 16, 1873	Boston, Mass	.08	.015
J. W. Hobbs*	June 16, 1873	do	.065	.0075
Kimberly Bros	June 16, 1873	Norfolk, Va	.15	.05125
Nathan Baum	June 16, 1873	do	.15125	.05125
A. H. Lindsay	June 16, 1873	do	.15375	.05375
Summy & Holmead	June 17, 1873	Washington, D. C	.10	.035
S. Gammage	June 17, 1873	do	.125	.06
J. T. Varnell*	June 17, 1873	do	.0549	.03
J. G. Carroll	June 17, 1873	do	.10	.029
William Turner	June 17, 1873	do	.10	.035
M. H. Homiller	June 17, 1873	do	.075	.0275
G. N. Beale	June 17, 1873	do	.0999	.03375
James Murphy*	June 18, 1873	Pensacola, Fla	.10	.04
J. S. Bell	June 18, 1873	do	.10	.05
Wagner & Leikauf	June 18, 1873	do	.10	.06
James F. Tobin*	June 21, 1873	San Francisco, Cal	.06	.0175
Felix Uri	June 21, 1873	do	.0675	.035
A. Newman†	June 21, 1873	do	.057	.014
J. B. Dow	June 21, 1873	do	.083	.0271
John Muller	June 21, 1873	do	.075	.05
Brackett & Keyes	June 21, 1873	do	.09	.03
John Stokell & Co*	June 23, 1873	Portsmouth, N. H	.10	.02

* Contract awarded.

† Declined to make contract.

K.—*Statement of contracts made by the Bureau of Provisions and Clothing for and in behalf of the Navy Department, during the fiscal year ending June* 30, 1873.

Name.	Date.	Articles contracted for.	Price.	Where to be delivered.
	1872.			
J. F. Tobin	July 1	130,000 pounds fresh beef.... per pound	$0.075	Mare Island, Cal.
Do	July 1	125,000 pounds fresh vegetables....do...	.015	Do.
John Stokell & Co...	July 3	20,000 pounds fresh beef .....do...	.12	Portsmouth, N.H.
Do	July 3	20,000 pounds fresh vegetables....do...	.02	Do.
Hobbs & Wilson	July 22	75,000 pounds fresh beef .....do...	.07	Boston, Mass.
Do	July 22	75,000 pounds fresh vegetables....do...	.00375	Do.
J. A. Oakes & Co	Sept. 9	200,000 pounds pickles.....do...	.0875	New York and Boston.
Wm. McKnight	Nov. 29	2,000 pairs calf shoes.....per pair	2.55	New York.
Do	Nov. 29	1,500 prs. cable-screwed calf shoes do...	2.29	Do.
Do	Nov. 29	4,000 prs. cable-screwed kip shoes do...	2.29	Do.
Wm. Mathews	Nov. 29	15,000 yds. Barnsley sheeting..per yard	.827	Do.
John Mundell & Co..	Dec. 9	1,000 prs. brass-screwed calf shoes, per pair.	2.55	Philadelphia, Pa.
Do	Dec. 9	1,000 prs. brass screwed kip shoes, per pair.	2.29	Do.
John Hanley	Dec. 19	100,000 pounds fresh beef.....per pound	.0721	New York.
Do	Dec. 19	100,000 pounds fresh vegetables....do...	.0119	Do.
Mission and Pacific Woolen Mills Co.	Dec. 28	40,000 yards blue flannel.....per yard	.565	Do.
Do	Dec. 28	6,000 prs. blue-cloth trowsers, per pair	6.125	Do.
Do	Dec. 28	15,000 yards blue flannel.....per yard	.565	Mare Island, Cal.
	1873.			
A. L. Haskell & Son..	Jan. 4	5,000 mattresses, with 2 covers each, at	6.57	New York, Philadelphia, & Boston.
Porous Water-Proofing Co.	Mar. 29	10,000 pairs water-proofed calf shoes, per pair.	3.05	Do.
John Dobson	May 20	4,000 pairs blankets.....per pair	5.85	New York.
Do	May 20	1,000 pairs blankets.....do...	6.18	Mare Island, Cal.
John Hanley	June 28	100,000 pounds fresh beef ....per pound	.13875	New York.
Do	June 28	100,000 pounds fresh vegetables....do...	.03875	Do.

No. 9.

BUREAU OF STEAM ENGINEERING.

NAVY DEPARTMENT,
Bureau of Steam Engineering, Washington, 1873.

SIR: In obedience to your order of ———, I have the honor respectfully to submit the annual report of this Bureau, with estimates for the several navy-yards; for repairs to the machinery of vessels of the Navy afloat; for the repair, preservation, and refitting of such as are required for service at sea; for stores and materials; and for the civil establishment in this Bureau and the navy-yards.

MACHINERY REPAIRED, UNDER REPAIR, AND TO BE REPAIRED.

During the year past the machinery of the following named vessels has been repaired and refitted for active service: Monongahela, (2d rate,) at the Kittery Navy-yard; Juinata, (3d rate,) at the Charlestown Navy-yard; Alaska, (2d rate,) Ossipee, (3d rate,) Kansas, (3d rate,) and Tigress, at the Brooklyn Navy-yard; Canandaigua, (2d rate,) Pilgrim, (tug,) and Pinta, (tug,) at the Philadelphia Navy-yard; Gettysburg, (4th rate,) and Fortune, (tug,) at the Washington Navy-yard; Mahopac (iron clad,) Jean Sands, (tug,) and Standish, (tug,) at the Norfolk Navy-yard; Saranac, (2d rate,) Benicia, (2d rate,) and Kearsarge, (3d rate,) at the Mare Island Navy-yard; and the Manhattan, (iron clad,) under contract with William Cramp & Sons, Philadelphia.

The Ashuelot, (3d rate,) Monocacy, (3d rate,) Saco, (3d rate,) and Palos, (4th rate,) having been retained on the Asiatic station, extensive

repairs were required upon their boilers; which have been executed in the machine shops of private establishments principally at Shanghai, China, and at the Government dock-yard at Yokoska, Japan. Extensive repairs are now required to the boilers of the Iroquois, (3d rate.)

The machinery of the Tennessee, (2d rate,) at New York, under contract with John Roach, is very nearly completed, being now ready for trial under steam.

The machinery of the following-named vessels is under repair: Plymouth, (2d rate,) Speedwell, (tug,) and Blue Light, (tug,) at Kittery; Franklin, (1st rate,) and Brooklyn, (2d rate,) at Charlestown, and Shawmut, (3d rate,) at Washington; Canonicus, (iron clad,) under contract with "The Harlan & Hollingsworth Company," Wilmington, Del.; and the Nahant and Wyandotte (iron-clads,) under contract with the "Delaware River Iron Works," while entirely new machinery of the compound type is being constructed for the Nipsic, (3d rate,) under contract with William Wright & Co., Newburgh, N. Y. The machinery of the following-named vessels is to have extensive repairs, and new boilers are to be put on board; Congress, (2d rate,) Lancaster, (2d rate,) Pensacola, (2d rate,) Nyack, (3d rate,) Wyoming, (3d rate,) and Tallapoosa, (4th rate). The hull of the Nevada, (2d rate,) having been condemned the machinery has been removed and advertised for sale.

MACHINERY PARTIALLY COMPLETED AND COMPOUND ENGINES.

With reference to the disposition of the machinery on hand stored in the several navy-yards, and that partially completed, (50 inches by 42 inches engines, Quinnebaug class,) the board of engineer officers appointed by the Department, under date of February 8 and May 3 of last year, have submitted their report. This report contains, in addition to conclusions and suggestions as to the disposition of the above machinery, the results of thorough investigations of the theory and practice of the compound engine. The tables are formed upon data believed to be absolutely reliable.

The following is their report:

WASHINGTON, D. C., *December* 16, 1872.

SIR: Relative to certain marine engines now stored in the navy-yards at Portsmouth, Boston, New York, Philadelphia, and Washington, examined by us under orders of the Navy Department, dated February 8, 1872, we beg leave to submit the following statement:

Among them are four sets of direct-acting engines for twin screw-vessels, each set comprising two pairs, with cylinders of 46½ inches diameter, designed for iron-clad vessels of the Kalamazoo class; and two pairs of geared engines of 100 inches diameter of cylinder, designed for screw-vessels of the Florida class. Of the former class none have ever been put in service. Of the latter class two pairs have been operated successfully at sea.

None of the engines above specified can be advantageously converted to the compound type. Those of the Kalamazoo class can be made to render efficient service in the propulsion of iron-clad vessels suitable for coast and harbor defense. Those of the Florida class can be used for the same purpose or for the propulsion of iron vessels of dimensions and form similar to those of the wooden vessels for which they were constructed, in which carrying qualities were subordinated to the one of great speed. None of these engines are adapted to the requirements of any of the vessels now in course of preparation by the Department; and the ycan only be disposed of either by preserving them for use in case of emergency, or by sale. In the latter case it is probable that the proceeds would not exceed the value of the material, considered as old metal.

Should any sudden emergency arise requiring the speedy construction of engines for use in harbor and coast defense, it would be found that facilities for meeting the demand do not exist in the country. The Department might be able to obtain machinery of a better type, but it would be only after a delay that might render the superiority of no avail. And the superiority would consist chiefly in a reduced cost of main-

tenance; doubtful, perhaps, and of but small importance at the best. Having regard, therefore, rather to the possible future needs of the Department than to the intrinsic merits or faults of the machinery above specified, we would recommend that it be preserved in the navy-yards until such time as the Department shall be supplied with better engines.

Besides the engines already mentioned there are stored in the navy-yards one pair of marine engines of 36 inches diameter of cylinder and 36 inches stroke of piston, known as the Swatara class; four pairs of 50 inches diameter of cylinder and 42 inches stroke of piston, known as the Benicia class; and twelve pairs of 60 inches diameter of cylinder and 36 inches stroke of piston, known as the Guerriere class. Most of the boilers constructed for them have been used to replace others of similar kinds worn out in service on board naval vessels. These engines are all of excellent design, and may be easily converted to the type known as compound-engines. With the exception of six pairs of the Guerriere class, all of them are yet in an incomplete condition.

Several vessels now in service are fitted with machinery precisely similar, and its performance has always been excellent. The engines are simple, durable, substantial in construction, and convenient of management. In these respects they are certainly not inferior to any marine engines now in use on board naval vessels, whether of the compound or any other type. They are designed to work steam of a boiler-pressure of 40 pounds to the square inch, and their valve-gear is arranged so as to admit of the use of the steam expansively at measures ranging from $1\frac{1}{2}$ to $2\frac{1}{2}$ times the initial volume. They are quite as economical in fuel as any other non-compound marine engines now in use. Examples of their economical performance are given in the tables appended to this report. In Table I, the cost of the power developed by them severally is collated with that of a large number of non-compound engines varying in design. The cost is expressed, both in pounds of steam, as ascertained by indicator measurement, and in pounds of coal, as found recorded in the steam-logs, consumed per horse-power per hour.

The number of pounds of steam given in the columns includes the quantity condensed in the cylinders in the production of the power; but the correction for known condensations due to other causes are not applied in Table I.

Inspection of the columns in which the cost of the power in coal is exhibited, will suffice to show the insufficiency of a comparison of the merits of the several engines with that quantity as a criterion. It is subject to such accidental conditions as cannot fail to render conclusions deduced from it erroneous.

It is preferred to accept the quantity of steam used as the correct measure for comparison. This quantity, computed from diagrams taken from the cylinders under ordinary circumstance of practice, is independent of all conditions that depend upon the performance of the boilers alone. In the second table the cost of the power developed by these engines, in pounds of steam per horse-power per hour, as measured by the indicator and corrected for the known condensations in the cylinder due to the production of the power and to other causes, is collated with the cost, ascertained in like manner, of the power developed severally by a number of English compound-engines of the latest and most approved construction.

The latter is the sum of the following quantities:

1. The number of pounds of steam per horse-power per hour discharged from the high-pressure cylinder, as measured by the indicator.

2. The number of pounds of steam per horse-power per hour condensed in the high-pressure cylinder in the production of the power, calculated upon the basis of Joule's equivalent.

3. The number of pounds of steam per horse-power per hour condensed in the steam-jackets, estimated upon the basis of an experiment made in 1860 with the pumping-engine of the Brooklyn Water-works.

It is assumed that the condensations in the high-pressure cylinder, due to causes other than the production of the power, are covered by the condensation in the steam-jackets. Whatever condensations occur, due to the difference of temperature between the interior surfaces of that cylinder and the entering steam, are countervailed by the re-evaporation of the water thereby precipitated upon those surfaces or suspended in the steam, and the water thus re-evaporated becomes available as steam for the development of power in the low pressure-cylinder.

The mean cost of the horse-power developed in the non-compound engines will compare with the mean cost of the horse-power in the compound engines, as follows:

1. Cost of the total horse-power of the non-compound engines, 28.46 pounds of steam; of the total horse-power of the compound engines, 19.05 pounds; the difference in favor of the latter, $\frac{28.46-19.05 \times 100}{28.46}=33.06$ per centum of the former.

2. Cost of the indicated horse-power of the non-componnd engines, 31.75 pounds of steam; of the indicated horse-power of the compound engine, 22.46 pounds; the difference in favor of the latter, $\frac{31.75-22.46 \times 100}{31.75}=29.26$ per centum of the former.

3. Cost of the net horse-power of the non-compound engines, 40.83 pounds of steam ; of the net horse-power of the compound engines, 27.18 pounds; the difference in favor of the latter, 40.83—27.18 × 100=33.43 per centum of the former. The indicated horse-power is the standard of comparison commonly employed in the current discussions of the performance of compound engines, although the net power would afford the rational standard. The gain of 29.26 per centum in the cost of the indicated power is much less than that usually claimed for the compound engines by persons interested in their manufacture. If, as is often asserted, the indicated horse-power is obtained at a cost of only two pounds of coal per hour, the boilers employed must evaporate 11.23 pounds of water per pound of coal. This quantity is much greater than has ever been evaporated by boilers of the types employed with the compound engines under consideration. The quantity of water evaporated in such boilers, per pound of coal, at the high rates of combustion generally employed in English practice, will be found not to exceed eight pounds of water from a temperature of 100° Fahrenheit. When the apparent evaporation is greater, the increase may be due to superheating the steam; the results of which practice would be equally advantageous in the case of engines of either type. The cost of the indicated horse-power, then, in pounds of coal per hour, would be $\frac{(22.46)}{8} = 2.81$. Taking the evaporation of the boilers used with the non-compound engines, at their maximum rate of combustion, to be nine pounds of water to the pound of coal, the cost of the indicated horse-power, in pounds of coal, will be $\frac{31.75}{9} = 3.53$. This quantity corresponds very nearly with the results recorded in the steam-logs of the engines in question when burning anthracite of good quality.

The difference in favor of the compound engines is, therefore $\frac{3.53 - 2.81 \times 100}{3.53} = 20.39$ per centum of the cost of the indicated horse-power of the non-compound engines in pounds of coal per hour. The boiler-pressure employed with the compound engines in question, is sixty pounds per square inch above the atmospheric pressure. The employment of so high a pressure has occasioned the adoption of a type of boiler cylindrical in form, constructed of thicker plates than have been commonly used for marine purposes. This type is thought to promise some advantages over that hitherto preferred for the naval service. The latter is, for the most part, of the vertical water-tube variety, quadrangular in form, and unrivaled in economy of fuel. It has been found lacking in durability since the use of surface-condensers has become general. It is expected that from the greater facility with which means for the prevention of corrosion, both internal and external, may be applied, due to the greater simplicity of their construction, in the reduction of the bracing and otherwise, the cylindrical boilers may be made to render service for a longer period than those they will replace. For equal areas of grate-surface, however, the space occupied upon the floors of the vessels by cylindrical boilers of diameters practicable in naval vessels of the lesser rates, exceeds that occupied by boilers of the quadrangular form by about 30 per cent. of the latter. Reducing the grate-surface in proportion to the expected gain in net power developed, the space required for the cylindrical will be nearly the same as for the quadrangular form for the development of the same power with equal rates of combustion. With a saving of 30 per cent. in the cost of the net power developed by the engines of a sea-going steamer, there will be for corresponding rates of combustion a corresponding saving of space for the stowage of fuel for steaming any given distance.

A great deal has been written in the current engineering journals in discussion of the causes to which the gain accomplished is due. The explanation most generally accepted is that which refers the improved results to the greater facility with which steam of high pressure can be employed at high measures of expansion. This is vague and unsatisfying. For, the gain in economy does not increase in the ratio of the augmentation of the measure of expansion, or nearly so, even. There is really no correspondence between the gains that should result according to the law of the expansion of gases and the gains accomplished in the use of compound engines.

The practical measure of expansion that has been found most economical in cylinders working steam of low pressure into a condenser, is about two times the initial volume; or, more correctly, the measure due to cutting off the steam at four-tenths the stroke of the piston. The low-pressure cylinder of the compound engine works under precisely the same conditions as the cylinders of ordinary condensing-engines. The initial volume of the steam received by it per stroke of piston is governed by the capacity of the high pressure cylinder. If, therefore, a measure of two times the initial volume be employed in the low-pressure cylinder, that cylinder should have twice the capacity of the high-pressure cylinder. The high-pressure cylinder works under nearly the same condition as the cylinders of ordinary non-condensing engines. The practical measure of expansion that has been found most economical in working steam of 60 pounds pressure in cylinders of non-condensing engines is four times the initial volume.

Now the compound engine is essentially an arrangement by which two engines, a

non-condensing and a condensing engine, are conjoined; and the best results will be obtained from it when the steam is worked in its several cylinders with that measure of expansion which would be appropriate for either, were it detached and worked by itself. The several measures of expansion in the two cylinders are, then, the factors which make up the total measure effected, and this practical measure is (4 by 2 =) eight times the initial volume. To increase either of these factors by any considerable amount for the sake of effecting a higher total measure of expansion for the development of the same power, would result in a direct increase of the cost of the power.

With a given capacity of high-pressure cylinder, therefore, it would seem useless to employ a low-pressure cylinder of a relative capacity greater than two or two and a half times the former. The best examples of English compound engines have cylinders whose relative capacity is as one to three; and there are many in which the proportion is as one to four. That the low-pressure cylinders of the compound engines, whose performance is given in the tables, and the measures of expansion employed in them are too large for economy will appear if we compare the cost of the total horse-power developed in them alone with the cost of the total horse-power developed in the cylinders of the non-compound engines. The mean quantity representing that cost is, for the compound engines, inclusive of the quantity condensed in the steam-jackets, the benefit of which is obtained in the low-pressure cylinders, 31.02 pounds of steam. The difference is $\frac{31.02 - 28.46 \times 100}{28.46} = 9$ per centum of the latter in favor of the non-compound cylinders. This comparison is made with those compound engines only in which the powers developed in the several cylinders are nearest equality. Had the low-pressure cylinders been smaller, the ratio of the back to the gross effective pressure in them would have been reduced in a greater proportion than the ratio of the receiver to the gross effective pressure in the high-pressure cylinder would have been increased, and a direct gain accomplished by a decided reduction of the total measure of expansion, and the distribution of the power between the two cylinders would have been more nearly equalized.

Thus it appears that there is a considerable gain in economy to be expected from the adoption of the compound engine for the naval service, with no sacrifice of economy of space occupied.

Whether they will fulfill the requirements of the service in other respects as well as is done by the engines now in use is a question that can be determined only by experience. They are more complex in arrangement, and the details include a greater number of parts. At least one of the cylinders must be fitted with a separate cut-off valve and gear. There is a greater number of steam-joints, and hence, as well as from the higher pressures employed, a greater liability to leakage. The action of the cylinders depends each upon that of the other, and neither can be made to act by itself without the employment of special appliances of a complicated and normally useless character, in the absence of which the disabling of one cylinder means the disabling of both.

Against these apparently not insuperable disadvantages, we have to set the promised gain of 25.8 per centum in the indicated horse-power obtained from the same weight of fuel consumed, and the probable greater longevity of the boilers.

From the above considerations we conclude that the three classes of engines in question may be advantageously converted to the compound type; and we have, under the direction of the Bureau of Steam Engineering, entered upon the preparation of designs for the necessary changes. In these plans we are, of course, unable to follow exactly the English precedents. Designs of machinery for vessels of war are made under conditions that differ greatly from those that determine its arrangement and disposition in vessels of commerce.

And the difference in the character of the fuel commonly used in this country, from that used in Great Britain, enforces a variation in practice, so far as the boilers are concerned, entailing a necessity for the appropriation of rather more space in the vessels for that portion of the motive power. It is only by experience, as we have said, that the Department can test the actual value of the improved machinery for naval purposes, and determine its merit for adoption, to the exclusion of other types in the future. In the pursuit of economy the conspicuous modification of engineering practice is in the pressures of steam employed. There is nothing new in the compound engine except this feature.

The mere combination of mechanical devices that distinguish it from engines of the common type has never availed for the reduction of the cost of steam-power, although the attempt to compass that object by their use has been made many times; and, in our judgment, the new system should be tested by competition, with such modifications of that now in vogue as would result from the employment of the steam-jacket, and of the higher pressures and speeds of piston to which its superiority in economy is chiefly due.

To this end we would recommend that, besides converting the pair of 36 by 36 inch engines of the Swatara class, now stored at Portsmouth, N. H., to the compound type,

one of the pairs of engines of the same class, lately removed from the Swatara and the Nantasket, be adapted to the use of steam-pressure as shall be employed in the compound engines, by removing the cylinders and replacing them by others of reduced area of piston, fitted with steam-jackets, by making such other modifications as may be required for the greater speed of piston to be employed, and by furnishing boilers the same in kind and number as are proposed for the engines of the same class converted to the compound type.

A very considerable gain in economy of fuel is certain to result from these modifications, and it is also certain that the non-compound engines thus converted will be convenient of management, simple in construction, not specially liable to derangement, and capable of operating singly by simple disengagement in case of injury to either. Vessels now in course of construction will dispose of all the engines of the 50 by 42 inch, and the 36 by 36 inch engines now stored at the navy-yards. Of the 60 by 36 inch engines only one pair can be disposed of in like manner at present, the New York being the only vessel designated by the Department that will require engines of this size. These engines will always be available for vessels of from 2,500 to 3,000 tons displacement.

In Table III the probable speed of the several vessels in which the engines herein considered may be placed, is given, with the weights of engines, boilers, &c., the weight of coal that may be stored in the bunkers, and the probable weight required for twenty-four hours' consumption. In designing the boilers and their appendages for all the vessels now in course of construction, we have provided for means of hoisting and lowering the smoke-pipes. This is done in accordance with prevailing naval practice. We are, nevertheless, of the opinion that the use of telescopic smoke-pipes is detrimental to the economical performance of the boilers, not to speak of the hazard involved in the carrying about of a contrivance so liable to derangement from probable accident.

For active and efficient combustion of the fuel to be used in our vessels of war, a high chimney, without orifice for the admission of cold air, is a desideratum, and such pipes cannot well be arranged for lowering and hoisting at will.

We are, sir, very respectfully, your obedient servants,

CHAS. H. LORING,
Chief Engineer, U. S. Navy.
CHARLES H. BAKER,
Chief Engineer, U. S. Navy

HON. GEORGE M. ROBESON,
Secretary of the Navy.

TABLE I.—*Exhibiting, for comparison, the cost (in pounds) of steam per horse-power per hour of a number of compound and non-compound two-cylinder engines, the quantities for the former being computed from the pressure at the termination of the stroke of piston in the high-pressure cylinder, and for the latter from the pressure at the termination of the stroke of both pistons, as determined by indicator-measurement.*

Names of vessels.	Horse-power.			Pounds steam per horse-power per hour.			Pounds coal per horse-power per hour.		
	Total.	Indicated.	Net.	Total.	Indicated.	Net.	Total.	Indicated.	Net.
NON-COMPOUND ENGINES.									
H. B. M. S. S. Monarch	9,484.5	7,451.8	6,470.8	21.40	26.70	30.80	2.2	2.8	3.2
Monarch	2,676.4	1,875.7	1,257.9	17.50	25.00	37.30	.....	.....	.....
U. S. S. S. Minnesota	1,239.0	880.1	699.6	23.90	33.70	42.40	.....	.....	.....
Franklin	1,588.2	1,221.5	1,067.4	24.60	32.00	36.60	3.2	4.2	4.8
Franklin	1,414.2	1,214.7	1,072.2	25.40	29.60	33.60	3.6	4.2	4.8
Guerriere	981.9	838.9	741.2	24.10	28.20	31.90	3.6	4.3	4.8
Guerriere	836.5	645.7	549.2	22.50	29.10	34.30	4.0	4.8	5.4
Guerriere	1,456.5	1,145.5	1,037.3	24.60	31.30	34.60	2.8	3.5	3.9
California	831.2	698.0	595.2	24.50	29.00	34.30	3.1	3.6	4.3
Delaware	453.3	369.9	327.6	25.40	31.00	35.00	4.2	5.2	5.8
Delaware	1,000.8	777.2	684.7	26.70	34.40	39.10	3.2	4.2	4.6
Delaware	1,141.8	1,011.8	903.8	25.80	28.90	32.50	2.5	2.9	3.2
Congress	1,466.8	1,221.5	1,103.4	26.50	31.80	35.20	3.8	4.6	5.1
Congress	649.9	571.9	479.3	25.40	28.80	34.40	3.8	4.2	5.1
Albany	649.9	489.4	399.4	25.70	34.10	41.80	3.5	4.1	5.7
Worcester	769.7	583.1	476.7	25.80	34.10	41.70	4.2	5.5	6.7
Severn	510.7	461.7	382.1	28.70	31.80	38.40	.....	.....	.....
Niagara	1,200.0	823.5	623.6	24.50	35.80	47.20	5.4	7.8	10.4
Niagara	1,203.6	879.3	699.1	25.10	34.30	43.20	3.3	4.6	5.8
Pensacola	481.2	423.5	361.8	23.10	26.20	30.70	3.9	4.4	5.1
Pensacola	685.5	598.8	529.4	24.70	28.20	32.00	3.3	3.7	4.2
Plymouth	1,095.4	744.6	639.4	25.10	36.90	41.50	2.9	4.3	5.3
Alaska	607.5	476.9	406.0	23.40	29.80	35.00	4.2	5.4	6.4
Benicia	960.1	759.0	662.2	23.50	29.70	34.00	3.1	3.9	4.5
Canandaigua	512.7	423.2	372.8	24.40	29.60	33.60	2.3	2.8	3.2
Canandaigua	387.6	261.2	214.0	23.60	35.10	42.90	4.3	6.5	7.9
Canandaigua	633.5	507.6	454.1	23.60	29.50	33.00	3.9	4.9	5.5
Juniata	681.3	569.6	514.9	24.40	29.20	32.30	4.4	5.2	5.8
Lackawanna	608.6	483.1	435.8	23.20	29.20	32.40	3.6	4.6	5.0
Lackawanna	496.0	407.9	365.9	23.00	27.90	31.10	3.4	4.1	4.6
Lackawanna	374.1	323.7	283.3	23.50	27.10	31.00	4.2	4.8	5.5
Ossipee	358.5	293.8	250.7	25.60	31.30	36.70	3.2	3.9	4.6
Ossipee	253.6	216.4	178.6	25.50	29.90	36.30	3.9	4.6	5.5
Monongahela	394.3	336.8	294.5	23.20	27.20	31.10	2.6	3.1	3.5
Monongahela	193.2	149.0	114.4	23.10	29.90	39.00	3.1	4.0	5.2
Ticonderoga	572.9	502.9	451.5	23.80	27.20	30.30	3.2	3.7	4.1
Shenandoah	654.4	592.6	540.1	25.60	28.30	31.10	4.5	5.0	5.5
Swatara	503.3	405.9	355.1	23.00	28.60	32.70	5.2	6.5	7.4
Resaca	253.6	209.9	169.9	23.80	28.70	35.50	2.3	4.7	5.8
Pawnee	792.6	593.6	491.1	22.60	30.20	36.50	3.8	5.1	6.2
Nevada	5,397.7	4,480.9	4,177.3	24.60	29.60	31.80	.....	.....	.....
COMPOUND ENGINES.									
S. S. ——	1,522.4	1,221.5	1,013.3	17.70	22.30	26.56	2.0	2.5	3.0
Italy	2,324.4	2,050.3	1,714.8	18.23	20.60	24.71	1.6	1.8	2.1
Italy	2,002.2	1,748.3	1,415.8	16.74	19.16	23.65	1.7	1.9	2.3
Spain	2,931.9	2,512.8	2,131.5	17.00	19.78	23.32	.....	.....	.....
Spain	1,899.6	1,619.8	1,259.7	16.73	19.62	25.23	1.6	1.8	2.3
Spain	2,755.1	2,437.4	2,056.1	17.24	19.49	23.10	1.8	2.0	2.4
Spain	3,053.0	2,569.0	2,125.3	19.05	22.60	27.36	1.77	2.1	2.5
City of Bristol	1,500.9	1,307.9	1,062.9	17.10	19.62	24.91	.....	.....	.....
Gracia	683.0	640.8	535.2	18.80	20.13	24.29	.....	.....	.....
Patagonian	1,887.7	1,600.1	1,302.6	16.50	19.50	23.90	.....	.....	.....
Batavia	1,721.9	1,380.7	1,136.9	18.40	23.00	27.90	1.8	2.2	2.7
Egypt	4,086.7	3,280.0	2,774.6	18.50	23.13	27.13	1.4	1.8	2.1
U. S. C. S. S. Hassler	229.0	193.5	174.6	16.96	20.08	22.20	.....	.....	.....
Hassler	219.8	177.2	157.6	17.20	21.38	24.04	.....	.....	.....
Hassler	164.8	135.3	122.3	16.28	19.90	22.00	.....	.....	.....

TABLE II.—*Exhibiting, for comparison, the cost of the power, in pounds of steam per horse-power per hour, of a number of compound and non-compound two-cylinder engines; the quantities, as ascertained by indicator measurement, being corrected by adding, in the case of the non-compound engines, the known condensations in the cylinders, for their several measures of expansion, as determined by the experiments of the Navy Department; and in the case of the compound engines, the quantity condensed in the steam-jackets, as estimated upon the basis of an experiment made with the pumping-engine of the Brooklyn Water-Works, in* 1860.

Description of engine.	Pounds of steam consumed per hour per total horse-power, inclusive of the quantity condensed in the production of the power.	Pounds of steam condensed in the steam-jackets per total horse-power, calculated upon the basis of an experiment with the engine of the Brooklyn Water-Works.	Pounds of steam condensed per total horse-power, due to all causes other than the production of the power.	Cost of the power in pounds of steam per horse-power per hour.			Pounds of steam consumed per total horse-power, developed in the low-pressure cylinder, inclusive of the quantity condensed in the steam-jackets.
				Total.	Indicated.	Net.	
The 60x36 in. Navy engines of the U. S. steamers—							
Guerriere	23.67	.....	4.99	28.66	35.70	40.56	.....
Delaware	25.96	.....	4.00	29.96	36.40	41.03	.....
California	24.50	.....	5.10	29.60	35.40	41.00	.....
Congress	25.95	.....	4.40	30.35	35.55	40.85	.....
The 50x42 in. Navy engines of the U. S. steamers—							
Alaska	23.40	.....	4.10	27.70	35.30	41.40	.....
Benicia	23.50	.....	4.30	27.80	35.20	40.30	.....
The 36x36 in. Navy engines of the U. S. steamers—							
Resaca	23.80	.....	5.00	28.80	34.80	43.00	.....
Swatara	23.00	.....	4.20	27.20	33.70	38.60	.....
The compound engines of the steamers—							
.....	15.90	2.18	.....	18.08	22.53	27.16	29.18
Italy	16.70	2.18	.....	18.88	21.49	26.10	31.57
Spain	16.60	2.16	.....	18.76	21.85	26.54	32.77
City of Bristol	16.20	2.11	.....	18.31	21.01	25.85	28.07
Gracia	18.30	2.32	.....	20.62	21.97	26.31	.....
Patagonian	15.90	2.04	.....	17.94	21.16	25.99	29.42
Batavia	17.60	2.27	.....	19.87	24.78	30.09	34.14
Egypt	17.70	2.28	.....	19.98	24.89	29.42	32.00
Mean of the—							
60x30 in. engines	25.02	.....	4.62	29.64	35.76	40.86	.....
50x42 in. engines	23.45	.....	4.20	27.75	35.25	40.85	.....
36x36 in. engines	23.40	.....	4.60	28.00	34.25	40.80	.....
Mean of the—							
Navy engines	23.95	.....	4.47	28.46	31.75	40.83	.....
Compound engines	16.86	2.19	.....	19.05	22.46	27.18	31.02

TABLE III.

Class of vessel.	Length in feet.	Breadth in feet.	Draught of water in feet, (from base line.)	Diameter of cylinder		Stroke of piston, in feet.	Number of boilers.	Grate-surface in boilers, in feet.	Weight of engine, in tons of 2,240 lbs.	Weight of boilers, including water, in tons of 2,240 lbs.	Weight of appendages to engines and boilers, in tons of 2,240 lbs.	Weight of coal in bunkers, in tons of 2,240 lbs.	Tons of coal per twenty-four hours.	Indicated horse-power (maximum.)	Immersed midship-section.	Speed of vessel in knots per hour.
				High pressure.	Low pressure.											
New York	315	47	18.0	59.0	80	3.0	10	390	216.0	286	94.2	300	53.0	1,780	733′.0	12.0
Quinnebaug	216	37	14.0	42.0	64	3.5	10	240	153.0	145	47.0	175	34.0	1,130	447′.0	12.0
Small iron sloops, 1873	175	32	11.5	29.0	45	3.0	5	120	64.75	80	39.7	120	17.0	560	335′.5	10.5
Iron sloops, 1873, with high-pressure non-compound engines	175	32	11.5	21.5	....	3.0	5	120	62.0	80	39.7	120	18.4	560	335′.5	10.5

Compound engines have never been used in vessels of the United States Navy, but have, however, been largely introduced in steamers of the commercial marine, and from the most reliable data the Bureau has been able to obtain, the method of using steam of high pressures and expanding in separate cylinders (one or more in number, depending upon the power to be transmitted,) is more economical and advantageous in its *practical* application than by the former method in single-cylindered engines with the pressures heretofore used in such cylinders.

50 INCH BY 42 INCH ENGINES—QUINNEBAUG CLASS.

The uncompleted engines (known as 50 inch by 42 inch) stored at several of the navy-yards, for which an appropriation was made by the last Congress to convert into compound engines and complete for the Marion, Vandalia, Swatara, Quinnebaug, Galena, and others, are well advanced towards completion. One pair at the navy-yard, Brooklyn, are nearly ready for erection on board the Swatara, and the other pair will be ready for the Quinnebaug in about two months. The delay in the latter has been in consequence of the failure to obtain iron of the proper quality for construction of the boilers. At the Charlestown navy-yard two pairs of these engines are nearly ready for erection, one for the Marion at Portsmouth, and the other for the Vandalia at Charlestown. Designs are in hand for two pairs of the same size and power for the Galena at Norfolk and the Mohican at Mare Island, the boilers for which have already been commenced.

MACHINERY FOR STEAM-VESSELS OF WAR.

The desire of the Department, in constructing the machinery for the new sloops-of-war authorized by act of Congress, approved February 10, 1873, was, that it should be of the very best type and design which the experience and practice of the day should have demonstrated to be the most perfect and best adapted to the propulsion of said vessels; and in order to avail itself of the experience and suggestions of the engineering profession of the entire country, proposals were solicited by advertisement for designs with the necessary specifications for the machinery required in vessels of 620 and 450 tons. All the information required by the designers in adapting the machinery to the vessel, power to be developed, &c., was furnished by the Bureau to such as applied therefor. The merits of the plans presented were to be determined by a board of competent engineers, and a reasonable compensation was to be paid for such designs as were adopted, either as a whole or in part.

Under this advertisement five plans were presented and referred to the board appointed under the following order of the Department:

NAVY DEPARTMENT,
Washington, D. C., June 18, 1873.

GENTLEMEN: You are hereby appointed a board to examine the plans and specifications received at this Department in conformity with an advertisement soliciting designs for steam-machinery under date of May 5, 1873.

Your attention is respectfully called to this advertisement and its requirements, in view of adopting for the vessels to be constructed for the Navy the best type of steam-machinery which modern practice has proved most economical and efficient, and that which can be most advantageously used in the propulsion of steam vessels of war, taking into consideration weight, space allowed, power developed, economy, arrangement of design for access of attendance and repairs, &c., &c.

You will carefully examine such designs and specifications as may have been sub

mitted under the advertisement, and report which of them, if any, are superior to the designs emanating from the Bureau of Steam Engineering, either in whole or in part, and if any possess novel features which in the opinion of the board should be used, and that may be embodied in the design finally recommended for adoption.

You will further report such compensation as may be, under the terms of the advertisement, properly awarded for the designs, in whole or in part, or that in your opinion considered best for the uses and requirements of steam vessels of war for the Navy, that may have been submitted under the advertisement.

Respectfully,

GEO. M. ROBESON,
Secretary of the Navy.

CHAS. H. LORING,
Chief Engineer, U. S. N.
CHAS. H. BAKER,
Chief Engineer, U. S. N.
ERASTUS W. SMITH, *A. D. D.*

After mature deliberation and consideration of the several plans presented, this board made the following report:

WASHINGTON, D. C., *June* 30, 1873.

SIR: In compliance with instructions contained in the communication of the Navy Department, dated June 18, 1873, we have carefully examined such designs and specifications as have been submitted in conformity with the terms of an advertisement soliciting designs for steam-machinery under date of May 5, 1873. The origin and character of these designs are as follows:

Of steam-machinery complete for vessels of the larger class designated in the advertisement:

1. One design for non-compound engines from Messrs. Lincoln & Rheuter, of Portsmouth, N. H.
2. One design of compound engines from Mr. T. Main, of New York.
3. One design of compound engines from Mr. William Wright, of Newburgh, N. Y.

Of engines alone:

4. One design of non-compound engines from Mr. E. S. Brady, of Jersey City, N. J., of boilers alone.
5. One design from Mr. C. E. Emery, of New York.

No designs of machinery adapted to use in vessels of war of the lesser class designated in the advertisement were submitted.

We do not find that any of the designs enumerated above are superior to those emanating from the Bureau of Steam Engineering, and we recommend the adoption of the latter, with the following modifications, viz, the increase of the diameter of the air-pump piston to 12 inches, and the use of a "built-up" crank, with counterbalances, instead of the disk-counterbalances originally proposed.

We find that among the designs submitted, and not recommended for acceptance, that of Thomas Main, of New York, is entitled to preference, and we recommend that the sum of $500 be paid as compensation for his, as the best rejected design. This design also embodied a method of balancing the momentum of the reciprocating parts of the engines, elsewhere recommended herein as a modification of the designs prepared at the Bureau, for which, in our judgment, he is entitled, under the terms of the advertisement and the instructions of the Department, to an award of $500.

We are, sir, very respectfully, your obedient servants,

CHAS. H. LORING,
Chief Engineer, U. S. N.
CHAS. H. BAKER,
Chief Engineer, U. S. N.
ERASTUS W. SMITH.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

It will thus be seen that no design presented was considered by the board, as a whole, preferable to those emanating from this Bureau, and upon this recommendation the designs of the Bureau were adopted, proposals to construct and erect the machinery and boilers were received, and the same placed under contract as follows: With the

Atlantic Works, Boston, Mass., one pair engines, 800 horse-power, for $175,000; contract dated August 16, 1873.

Atlantic Works, Boston, Mass., one pair engines, 800 horse-power, for $163,000; contract dated August 16, 1873.

James Murphy & Co., New York, one pair engines, 800 horse-power, for $175,000; contract dated September 11, 1873.

John Roach, New York, one pair engines, 560 horse-power, for $120,000; contract dated September 11, 1873.

Woodruff Iron Works, Hartford, Conn., one pair engines, 800 horse-power, for $175,000; contract dated October 4, 1873.

A contract was also made with W. Wright & Co., Newburgh, N. Y., for the construction and erection of one pair engines, same design, 800 horse-power, for the Nipsic, for $175,000; contract dated September 11, 1873.

All of the above are to be completed within six months from date of their respective contracts, and erected on board vessels within three months from the time that they shall be notified that the vessel is ready, after such completion.

INTERNAL CORROSION OF NAVAL BOILERS.

By careful analysis made at the naval laboratory, Brooklyn, the rapid corrosion of boilers in steam-vessels of the Navy using surface-condensers, has been found to be caused by oleate of copper formed in the coudenser, from which it passes into the boilers, where it is slowly transformed into oleate of iron, deriving the iron from different parts of the boiler with which it comes in contact, and precipitating its copper. The oleate of copper adhering to the iron under the conditions of high pressures and temperatures, the deposition of copper and the absorption of the iron begin.

To prevent this rapid deterioration of steam-boilers, an apparatus has been devised and patented by Mr. W. C. Selden, of New York, which has been introduced in several steamers of the merchant marine. This invention consists in a method of arresting the destructive agents formed in the condenser, and preventing their introduction into the boilers. It has been introduced in a few of the steamers of the Navy, and the reports as to its value and efficiency for the purposes for which applied are highly favorable, promising great success in prolonging the life-time of boilers to which it may be applied.

SCREW-PROPELLERS.

In many cases the original screws of four blades were removed from our naval steamers, and screws of two blades substituted. These changes were determined upon by the Department, with a view to rendering such vessels more efficient while under sail alone, by the supposed decreased resistance opposed to the vessel by screws of two blades, rather than those with four. In all cases where this change has been made, reports are received of the inefficiency of the two-bladed screw, as compared with those of four blades with which these vessels were originally fitted. With equal propelling-surface, no advantage whatever can be derived from using a screw of two instead of four blades, while under sail alone, because, when screws are uncoupled and revolving freely, screws of four blades oppose no greater resistance to the vessel than one of two. When fixed and held stationary, in a vertical position behind the stern-post, the loss of speed due to the resistance of the screw, expressed in percentages of the speed, has been determined by careful experiments to be 18.29 per cent., while the four or

two bladed screw revolving freely by pressure of the water gives a resistance of only 9.96 per cent., being very nearly two to one in favor of the revolving screw.

The shocks caused to the vessel by the blades passing the stern-post are diminished as the number of blades is increased; the four-bladed screw producing less vibration in the ship than one of three, and one with three blades less than one with two.

The propelling efficiency of a screw is entirely independent of the number of its blades, but is wholly dependent upon the area, the pitch, the fraction of the pitch used, and the area of the circle described by the blades.

To diminish the shocks and vibration more or less incidental to the use of the screw-propeller, the largest amount of clearance admissible for the screw between the stern and rudder-posts should be given. It is obvious, then, that a port intended for a screw whose area is contained in four blades cannot receive a screw of two blades having the same area, pitch, and fraction of the pitch, for that screw must be just double the length of the former in the line of its axis. Consequently, the two-bladed screws which were substituted for those of four blades were necessarily constructed of less propelling areas, as the port-openings of the vessels could not be enlarged. Hence, the inefficiency of the screws substituted as reported.

ENGINEER FORCE ON SHIPBOARD.

In the quarterly reports of the steam departments of vessels in commission come many complaints of the inefficiency of this force under its present organization. In some cases the machinists have been trustworthy and reliable, but in many others they have been the opposite, leading us to believe that the position given them in the service is not of sufficient importance to induce the class of men that is really needed to perform this duty to accept these rates.

Except in certain cases, *firemen* no longer exist on our vessels of war, and their places are taken by men known as "seamen, engineer force," and "ordinary seamen, engineer force." It was expected that the old firemen would enlist under these new rates and regulations, and at first, to a certain extent they did. That time, however, seems to have passed, and these rates are now frequently given to men who know little or nothing about the duties of firemen. From one ship a statement is made that one of the "ordinary seamen, engineer force," had never been at sea, and that he had never before used firing-tools. A large proportion of these reports make similar statements regarding the inefficiency of these men as firemen, and also the short time they are allowed below in the engineering department, being called on deck for various drills at all hours of the day.

I would respectfully suggest that as many first and second class firemen as would together be able to do duty as oilers and properly fire all the furnaces, be shipped for duty in the steam department only, and that, when steaming, landsmen be taken from deck for coal-heavers.

The estimates for the year will be found in the accompanying papers.

Very respectfully, your obedient servant,

WM. W. W. WOOD,
Chief of Bureau.

Hon. GEO. M. ROBESON,
Secretary of the Navy.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1875, *by the Bureau of Steam Engineering.*

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
SALARIES.		
Chief clerk, per act of July 5, 1862, (12 Stat. at L., p. 511, sec. 3)	$1,800 00	.....
Draughtsman, per act of July 5, 1862, (12 Stat. at L., p. 511, sec. 3,) and March 2, 1867, (14 Stat. at L., p. 450, sec. 1)	1,800 00	.....
One clerk of class two, per act of March 2, 1867, (14 Stat. at L., p. 450, sec. 1)	1,400 00	.....
One assistant draughtsman, per act of July 5, 1862, (12 Stat. at L., p. 511, sec. 3)	1,200 00	.....
*One assistant draughtsman; (submitted)	1,200 00	.....
One messenger, per act of July 5, 1862, (12 Stat. at L., p. 511, sec. 3,) and July 12, 1870, (16 Stat. at L., p. 250, sec. 3)	840 00	.....
One laborer, per act of July 5, 1862, (12 Stat. at L., p. 511, sec. 3,) and July 12, 1870, (16 Stat. at L., p. 250, sec. 3)	720 00	.....
	8,960 00	$7,760
CONTINGENT EXPENSES.		
Stationery and miscellaneous items, (appropriated)	1,000 00	800 00
PUBLIC PRINTING AND BINDING.		
For printing and binding, to be executed under the direction of the Congressional Printer, per act of March 8, 1872, (17 Stat. at L., p. 82, sec. 2)	3,000 00	3,000 00
STEAM-MACHINERY.		
Repairs and preservation of machinery, boilers, &c., on all naval steam-vessels, (appropriated)	†1 500,000 00	1,000,000 00
Fitting, repairs, and preservation of machinery and tools in the several navy-yards, (appropriated)	50,000 00	50,000 00
Labor in navy-yards and stations, not included above, and incidental expenses, (appropriated)	100,000 00	100,000 00
Purchase and preservation of oils, coals, iron, and all material and stores, (appropriated)	‡500,000 00	400,000 00
Completing and erecting on board vessels five pairs of compound engines, with boilers, &c., complete, (appropriated)	§300,000 00	750,000 00
	2,450,000 00	2,300,000 00
CIVIL ESTABLISHMENT.		
At the navy-yard, Portsmouth, N. H.:		
Draughtsman, at $1,600; clerk to chief engineer, and store-clerk, at $1,400 each; and time-clerk, at $1,200; in all, (appropriated)	$5,600 00	.....
At the navy-yard, Charlestown, Mass.:		
Draughtsman, at $1,600; clerk to chief engineer, and store-clerk, at $1,400 each; and time-clerk, at $1,200; in all, (appropriated)	5,600 00	.....
At the navy-yard, Brooklyn, N. Y.:		
Draughtsman, at $1,600; clerk to chief engineer, and store-clerk, at $1,400 each; and time-clerk, at $1,200; in all, (appropriated)	5,600 00	.....
At the navy-yard, Philadelphia, Pa.:		
Draughtsman, at $1,600; clerk to chief engineer, and store-clerk, at $1,400 each; and time-clerk, at $1,200; in all, appropriated)	5,600 00	.....
At the navy-yard, Washington, D. C.:		
Draughtsman, at $1,600; clerk to chief engineer, and store-clerk, at $1,400 each; and time-clerk, at $1,200; in all, (appropriated)	5,600 00	.....
At the navy-yard, Norfolk, Va.:		
Draughtsman, at $1,600; clerk to chief engineer, and store-clerk, at $1,400 each; and time-clerk, at $1,200; in all, (appropriated)	5,600 00	.....
At the navy-yard, Pensacola, Fla.:		
Clerk of store-houses, at $1,200; increase submitted, $200, (appropriated)	1,400 00	.....
At the navy-yard, Mare Island, Cal.:		
Draughtsman, at $1,600; clerk to chief engineer, and store-clerk, at $1,400 each; and time-clerk, at $1,200; in all, (appropriated)	5,600 00	.....
	40,600 00	$40,400 00

*The services of an assistant draughtsman are necessary to assist in copying and restoring drawings injured by the late fire in the Navy Department.

† The increase of $500,000 in this item is absolutely needed for the purpose of rebuilding and repairing boilers on board vessels, which boilers are now almost unserviceable.

‡ This estimate is based upon actual wants, as shown by schedules received from the several navy-yards.

§ The former appropriation did not include cost of erecting on board vessels.

‖ This increase is recommended, as this clerk has to act as chief engineer's, store, and time clerk, and $1,400 is the pay of store-clerk at all the other yards.

No. 10.

BUREAU OF CONSTRUCTION AND REPAIR.

NAVY DEPARTMENT,
BUREAU OF CONSTRUCTION AND REPAIR,
November 5, 1873.

SIR: I have the honor to forward, in compliance with your instructions, the estimates for appropriations for the annual expenditures for the fiscal year commencing July 1, 1874, coming under the cognizance of the Bureau of Construction and Repair.

Estimates in tables marked A and B are for the pay of employés attached to this Bureau, and at the several navy-yards, as authorized by law.

Estimate in table marked C is for the preservation of vessels on the stocks and in ordinary; purchase of materials and stores of all kinds; labor in navy-yards and on foreign stations; preservation of material; purchase of tools; wear and tear and repair of vessels afloat, and general maintenance of the Navy; incidental expenses and foreign postage.

Estimate in table marked D is for the preservation of live-oak timber upon Government lands reserved for naval purposes.

I beg leave to call your attention to the inclosed list of vessels which have been repaired during the past year, by which it will be seen that a very large number in proportion to the whole are deteriorating, and their days of usefulness are rapidly passing away.

It may be seen by official statistics that the loss of vessels by wear, tear, and the disasters of the sea is equal to 10 per cent. per annum, and that that percentage must be supplied in new vessels every year to keep the original number up.

Although Government vessels are built generally of more durable materials than those of the merchant marine, the causes for deterioration in the former are greater than in those of the latter; consequently, if that percentage is not supplied in new vessels to the Navy, there is either a diminution in the number of vessels, or the number can only be kept up by extensive and costly repairs, the course pursued heretofore. But the expenditure would produce a better result if the number of vessels equal to this loss were constructed every year, as it would afford an opportunity for adopting all the improvements of the day, and thus, in proportion to the number, equal other nations in the efficiency of our Navy.

The eight steam-sloops authorized by act of Congress are in process of construction, and their completion will be hastened with due regard to economy.

The vessels built under the act above named will meet the pressing wants of the Government required of that particular class, but in any emergency, when especially a demand has to be made for redress, or for the immediate protection of the rights of our citizens abroad, naval vessels of more formidable character are required.

A number of the most available iron-clads have been repaired, and are nearly ready for sea, but a number of the most power require very extensive and expensive repairs, which, owing to the limited amount of past appropriations, have not been made. These double-turreted iron-armored vessels should be repaired immediately, as their services may be needed in any sudden emergency.

Large and powerful sea-going iron-clads, whose power for resistance and attack may be graded from their origin to that of the latest and

most approved of the present day, seem to form the principal strength of all important maritime nations; and of which those of the monitor type are considered the most formidable, inasmuch as they present less surface for iron plating in proportion to their displacement than that of any other form. Of the above type there are a number which can be improved and repaired, making very efficient vessels, and which, until the power of ordnance, the resistance of practical iron armor, and the effect of the submerged torpedo is fully developed, would, it is thought, be sufficient.

Foreign nations seem to be gradually comprehending the future of a transition of naval iron-clads to the *swift*, invulnerable torpedo-vessel, whose power to destroy any of the most formidable and reliable vessels of war is not disputed.

The torpedo appears to be the most terrible and destructive implement of warfare ever brought into use upon the ocean, and many objections are urged against its barbarous effect, yet there seems to be no difference, in a moral point of view, in sinking a vessel and all on board with it than by the shot of a 20-inch gun, fired behind an invulnerable breastwork.

With the device for using torpedoes, already well demonstrated, a sufficient number of these invulnerable swift vessels need only to be built to carry on a successful warfare with any nation known; and our harbors can easily be protected from an enemy without the expensive fortifications now in process of erection.

Very respectfully, your obedient servant,

I. HANSCOM,
Chief of Bureau.

Hon. GEORGE M. ROBESON,
Secretary of the Navy.

Vessels repaired at the different navy-yards during the fiscal year 1872–'73, *under the cognizance of the Bureau of Construction and Repair.*

Dacotah.
Independence.
Jamestown.
Kearsarge.
Monadnock.
Mohican.
Monterey.
Nyack.
Resaca.
Saranac.
Tuscarora.
Vanderbilt.
Blue Light.
Marion.
Monongahela.
Plymouth.
Brooklyn.
Cohasset.
Connecticut.
Franklin.
Iowa.
Juniata.
Leyden.
Miantonomah.
Niagara.
Ohio.
Oregon.
Pennsylvania.
Powhatan.
Severn.
Shawmut.
Vandalia.
Virginia.
Wassuc.
Alaska.
Guard.
Kansas.
Minnesota.
Ossipee.
Portsmouth.
Swatara.
Supply.
Tennessee.
Tigress.
Ajax.
Antietam.
Constitution.
Glance.
Manhattan.
Nebraska.
Omaha.
Pilgrim.
Pinta.
Potomac.
Quinnebaug.
Richmond.
St. Louis.
Sorrel.
Terror.
Fortune.
Frolic.
Gettysburg.
Nipsic.
Relief.
Rescue.
Shawmut.
Tallapoosa.
Triana.
Constellation.
Galena.
Jean Sands.
Mahopac.
New Hampshire.
Powhatan.
Richmond.
Saugus.
Snow Drop.
Standish.
Savannah.
Worcester.
Benicia.
California.
Camanche.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1875, by the Bureau of Construction and Repair.

Detailed object of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
A.		
SALARIES.		
Chief clerk, per act of July 5, 1862, (12 Stat. at L., p. 511, sec. 3)	$1,800 00	.....
Draughtsman, per act of March 2, 1867, (14 Stat. at L., p. 450, sec. 1)	1,800 00	.....
One clerk of class four, per act of July 23, 1866, (14 Stat. at L., p. 207, sec. 8)	1,800 00	.....
Two clerks of class three, per act of July 23, 1866, (14 Stat. at L., p. 207, sec. 8)	3,200 00	.....
Two clerks of class two, per act of July 23, 1866, (14 Stat. at L., p. 207, sec. 8)	2,800 00	.....
One messenger, per acts of July 5, 1862, (12 Stat. at L., p. 511, sec. 3,) and March 3, 1869, (15 Stat. at L., p. 287, sec. 1)	840 00	.....
One laborer, per acts of July 5, 1862, (12 Stat. at L., p. 511, sec. 3,) and March 3, 1869, (15 Stat. at L., p. 287, sec. 1)	720 00	.....
	12,960 00	$12,960 00
CONTINGENT.		
Stationery and miscellaneous items, appropriated, (16 Stat. at L., p. 493, sec. 1)	800 00	800 00
PRINTING AND BINDING.		
Printing and binding, to be executed under the direction of the Congressional Printer, (appropriated)	10,000 00	.....
B.		
CIVIL ESTABLISHMENT.		
At the navy-yard, Kittery:		
Clerk of store-houses, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 8)	1,500 00	.....
Clerk to naval constructor, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 8)	1,400 00	.....
Time-clerk, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 8)	1,400 00	.....
Draughtsman to naval constructor, (appropriated, Stat at L., pamphlet edition, p. 21, sec. 8)	1,400 00	.....
Inspector of timber, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 8)	1,400 00	.....
Superintendent of floating-dock, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 8)	1,400 00	.....
Increase of salary of draughtsman, (submitted)	200 00	.....
	8,700 00	.....
Reduction of salary of clerk of store-houses, (submitted)	100 00	.....
	8,600 00	8,500 00
At the navy-yard, Charlestown:		
Clerk of store-houses, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 9)	1,200 00	.....
Clerk to naval constructor, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 9)	1,500 00	.....
Time-clerk, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 9)	1,500 00	.....
Draughtsman to naval constructor, (appropriated, Stat., at L., pamphlet edition, p. 21, sec., 9)	1,400 00	.....
Inspector of timber, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 9)	1,500 00	.....
Increase of salary of clerk of store-houses, (submitted)	300 00	.....
Increase of salary of draughtsman, (submitted)	200 00	.....
	7,600 00	7,100 00
At the navy-yard, Brooklyn:		
Clerk of store-houses, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 10)	1,200 00	.....
Clerk to naval constructor, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 10)	1,500 00	.....
Time-clerk, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 10)	1,500 00	.....
Draughtsman to naval constructor, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 10)	1,400 00	.....
Inspector of timber, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 10)	1,500 00	.....
Increase of salary of clerk of store-houses, (submitted)	300 00	.....
Increase of salary of draughtsman, (submitted)	200 00	.....
	7,600 00	7,100 00

Estimates of appropriations required by the Bureau of Construction and Repair, &c.—Cont'd.

Detailed object of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
CIVIL ESTABLISHMENT—Continued.		
At the navy-yard, Philadelphia:		
Clerk of store-houses, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 11)	$1,200 00	.....
Clerk to naval constructor, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 11)	1,400 00	.....
Time-clerk, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 11)	1,400 00	.....
Draughtsman to naval constructor, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 11)	1,400 00	.....
Inspector of timber, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 11)	1,400 00	.....
Superintendent of floating-dock, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 11)	1,400 00	.....
Increase of salary of draughtsman, (submitted)	200 00	.....
Increase of salary of clerk of store-houses, (submitted)	200 00	.....
	8,600 00	*$8,700 00
At the navy-yard, Washington:		
Clerk of store-houses, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 12)	1,200 00	.....
Clerk to naval constructor, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 12)	1,200 00	.....
Time-clerk, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 12)	1,200 00	.....
Inspector of timber, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 12)	1,200 00	.....
Draughtsman to naval constructor, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 12)	1,400 00	.....
Increase of salary of clerk to naval constructor, (submitted)	200 00	.....
Increase of salary of clerk of store-houses, (submitted)	200 00	.....
Increase of salary of draughtsman, (submitted)	200 00	.....
	6,800 00	6,200 00
At the navy-yard, Norfolk:		
Clerk of store-houses, (appropriated, Stat. at L., pamphlet edition, p. 22, sec. 1)	1,400 00	.....
Time-clerk, (appropriated, Stat. at L., pamphlet edition, p. 22, sec. 1)	1,200 00	.....
Draughtsman to naval constructor, (appropriated, Stat. at L., pamphlet edition, p. 22, sec. 1)	1,400 00	.....
Salary of clerk to naval constructor, (submitted)	1,400 00	.....
Salary of inspector of timber, (submitted)	1,400 00	.....
Increase of salary of draughtsman, (submitted)	200 00	.....
Increase of salary of time-clerk	200 00	.....
	7,200 00	4,000 00
At the navy-yard, Pensacola:		
Clerk of store-houses, (appropriated, Stat. at L., pamphlet edition, p. 22, sec. 2)	1,400 00	1,400 00
At the navy-yard, Mare Island:		
Clerk of store-houses, (appropriated, Stat. at L., pamphlet edition, p. 22, sec. 3)	1,500 00	.....
Clerk to naval constructor, (appropriated, Stat. at L., pamphlet edition, p. 22, sec. 3)	1,500 00	.....
Time-clerk, (appropriated, Stat. at L., pamphlet edition, p. 22, sec. 3)	1,500 00	.....
Inspector of timber, (appropriated, Stat. at L., pamphlet edition, p. 22, sec. 3)	1,500 00	.....
Draughtsman to naval constructor, (appropriated, Stat. at L., pamphlet edition, p. 22, sec. 3)	1,400 00	.....
Superintendent of floating-dock, (appropriated, Stat. at L., pamphlet edition, p. 22, sec. 3)	1,500 00	.....
Increase of salary of draughtsman, (submitted)	200 00	.....
	9,100 00	8,900 00
	56,900 00	51,900 00
Increase, &c., submitted	.....	5,600 00
		57,500 00
Submitted reduction, clerk of store-houses, Kittery	.....	100 00
		57,400 00

* The remaining difference of $500 is occasioned by the aggregate of the several salaries for the Philadelphia yard being stated in the appropriation act as $8,700, instead of $8,200, the correct addition of the several sums.

Estimates of appropriations required by the Bureau of Construction and Repair, &c.—Continued.

Detailed object of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
CIVIL ESTABLISHMENT—Continued.		
The difference between the amount appropriated for the fiscal year ending June 30, 1874, and the amount required for the fiscal year ending June 30, 1875, arises from:		
Submitted increase of salary of draughtsman at Kittery	$200 00	.....
Submitted increase of salary of clerk of store-houses at Charlestown	300 00	.....
Submitted increase of salary of draughtsman at Charlestown	200 00	.....
Submitted increase of salary of clerk of store-houses at Brooklyn	300 00	.....
Submitted increase of salary of draughtsman at Brooklyn	200 00	.....
Submitted increase of salary of draughtsman at Philadelphia	200 00	.....
Submitted increase of salary of clerk of store-houses at Philadelphia	200 00	.....
Submitted increase of salary of clerk to naval constructor at Washington	200 00	.....
Submitted increase of salary of clerk of store-houses at Washington	200 00	.....
Submitted increase of salary of draughtsman at Washington	200 00	.....
Submitted for salary of clerk to naval constructor at Norfolk	1,400 00	.....
Submitted for salary of inspector of timber at Norfolk	1,400 00	.....
Submitted increase of salary of draughtsman at Norfolk	200 00	.....
Submitted increase of salary of time-clerk at Norfolk	200 00	.....
Submitted increase of salary of draughtsman at Mare Island	200 00	.....
	5,600 00	.....
Submitted reduction of salary of clerk of store-houses at Kittery	100 00	.....
	5,500 00	.....
C.		
CONSTRUCTION AND REPAIR OF VESSELS.		
Preservation of vessels on the stocks and in ordinary; purchase of materials and stores of all kinds; labor in navy-yards and on foreign stations; preservation of material; purchase of tools; wear, tear, and repair of vessels afloat, and general maintenance of the Navy; incidental expenses, advertising and foreign postages, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 6)	3,500,000 00	$3,500,000 00
Construction of eight steam-vessels of war, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 5)	.....	3,200 000 00
PROTECTION OF IRON-CLADS.		
Repair and preservation of iron-clads, (submitted)	600,000 00	.....
D.		
PROTECTION OF TIMBER-LANDS.		
Salaries of sub-agents and watchmen, and miscellaneous expenses, (appropriated, Stat. at L., pamphlet edition, p. 21, sec. 7)	5,000 00	5,000 00

BUREAU OF CONSTRUCTION AND REPAIR, *September* 1, 1873.

Offers to furnish and deliver 25,000 *pounds ingot-copper, "lake," at the Washington navy-yard, under advertisement of the Bureau of Construction and Repair, March* 17, 1873.

David Babcock & Co	$8,700 00
Joseph L. Savage	8,972 50
*Holmes & Lissberger	8,562 50

Opened in presence of—

I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *April* 8, 1873.

*Accepted.

Offers to furnish and deliver 50,000 *cubic feet of live-oak timber at either the Kittery, Charlestown, or Brooklyn navy-yard, or such proportion of the amount at either yard as the Department may direct, made under the advertisement of the Bureau of Construction and Repair of March* 19, 1873.

	Principal pieces per cubic foot.	Curved timber per cubic foot, 13 and 15 inch.	Curved timber per cubic foot, 12 inch.	Straight timber.
S. P. Brown	$1 40	$1 69	$1 90	$1 35
James Bigler & Co	1 75	1 50	1 50	1 20
* W. C. N. Swift	†2 00	†1 70	†1 70	†1 40

*Received after time.
† Ten cents per cubic foot to be added for deliveries at Charleston and Kittery.

[Neither of the above offers was accepted.]

Opened in presence of—
I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *April* 17, 1873.

Offers to furnish and deliver live-oak timber in quantities of from 3,000 *to* 25,000 *cubic feet at each of the navy-yards, Charlestown and Brooklyn, made under the advertisement of the Bureau of Construction and Repair of March* 19, 1873.

	Principal pieces per cubic foot	Curved timber per cubic foot.	Straight timber per cubic foot.
S. P. Brown	$1 79	$1 79	$1 79
James Bigler & Co	†2 00	†1 70	†1 40
* W. C. N. Swift	†2 00	†1 70	†1 40

*Received after time.
† For deliveries required to be made at Charleston or Kittery ten cents per cubic foot to be added.

[The offer of J. Bigler & Co. was accepted for 25,000 cubic feet, deliverable at Brooklyn and Kittery; and of W. C. N. Swift for the same quantity, deliverable at Brooklyn and Charlestown.]

Opened in presence of—
I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *April* 17, 1873.

Offers to furnish and deliver 50,000 *pounds ingot-copper at the Washington navy-yard, under advertisement of the Bureau of Construction and Repair of May* 10, 1873.

* Holmes & Lissberger	$16,250
David Babcock & Co	16,600
C. C. Douglass	17,000
A. R. Shepherd & Co	18,250
Joseph L. Savage	16,345

Opened in presence of—
I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*
NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *May* 20, 1873.

Offers to furnish and deliver 100,000 *pounds ingot-copper* (50,000 *pounds "lake," and* 50,000 *pounds other than "lake,") at the Washington navy-yard, under advertisement of Bureau of Construction and Repair of July* 17, 1873.

D. Babcock & Co	$27,960 00
Holmes & Lissberger	27,875 00
Hyatt & Spencer	28,187 50
George H. Creed	29,400 00
Pope, Cole & Co	*27,550 00
Joseph L. Savage	28,400 00
N. L. Simpkins	28,500 00

Opened in presence of—
I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*
NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *July* 31, 1873.

Proposals for the construction of two iron steam sloops-of-war, offered under the advertisement of the Bureau of Construction and Repair of June 18, 1873.

	Vessel complete.	Hull only.
Wm. Cramp & Sons	one $325,000	
John Roach	two *$290,000 each	
The Harlan & Hollingsworth Company	two $350,000 each	
Atlantic Works	one $305,000	one $185,000
	two for $592,000	two $362,000

*Accepted for two vessels.

Opened in presence of—
I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*
NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *August* 1, 1873.

Proposals for the construction, including all the necessary materials except the live-oak timber, of the hull of a steam sloop-of-war of about 640 *tons, offered under the advertisement of the Bureau of Construction and Repair of June* 21, 1873.

Nathaniel McKay	$185,000
Thomas Stack	148,500
Donald McKay	168,000
Robert E. Jackson	169,950

*Accepted.

William W. Bates		$180,000
John Englis & Son		190,000
John W. Griffiths		179,400
†John W. Lynn,	(delivered at Philadelphia)	83,000
	(delivered at New York)	83,500
	(delivered at Boston)	84,000

Opened in presence of—
I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*
NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *August* 7, 1873.

Proposals for building sloop-of-war at Kittery navy-yard, (labor only,) offered under advertisement of the Bureau of Construction and Repair of July 30, 1873.

E. K. McMichael, all except blacksmith work	$46,725
*John W. Griffiths, all except blacksmith work	46,200
Simon McKay, all except blacksmith work	52,600
William Fernald, all carpenter work	46,000
Cate & Huntress, joiner work, in and out	19,965
Levi Remick, joiner work, in and out	17,600
Joseph W. Marden, joiner work, in and out	13,340
Samuel A Tobey, joiner work, in and out	13,390
Jesse M. Wilson, calking and scraping	5,325
Green & Adams, calking and scraping	3,700
Benjamin Bailey, calking and scraping	3,800
John Remick, raising framing, ribboning, and planking	13,500
S. F. Trefethan, decking and strapping	10,800
Badger & Hunter, timbering, strapping, and planking	10,460
William W. Dixon, outboard joiner work	3,300
Samuel Clark, inboard joiner work	9,700
Berry & Jones, blacksmith work	25,645
Joseph E. Fernald, first calking	4,800

Opened in presence of—
I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*
NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *September* 1, 1873.

Offers to furnish and deliver 50,000 *pounds of ingot-copper, other than "lake," at the Washington Navy-yard, under advertisement of Bureau of Construction and Repair of September* 4, 1873.

David Babcock & Co	$13,650 00
Pope, Cole & Co	13,250 00
Joseph L. Savage	*13,125 00

Opened in presence of—
I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *September* 22, 1873.

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*Accepted. † Withdrew his bid.

Offers to furnish material for the navy, under the advertisement of the Bureau of Construction and Repair of April 29, 1873, at the navy-yard, Kittery, Maine.

Class No. 1. White-oak logs:‡

Samuel Richardson	$5,500 00
Thomas W. Butt	7,200 00
W. M. Shakspear	6,000 00
Trickey & Jewett	6,000 00
William White	6,600 00
S. P. Brown	7,800 00
George T. Wallace	6,550 00

Class No. 2. White-oak keel-pieces:

Thomas W. Butt	*1,144 00
W. M. Shakespear	1,235 00
Trickey & Jewett	1,300 00
William White	1,950 00
S. P. Brown	2,340 00
George T. Wallace	1,560 00

Class No. 3. White-oak curve timber:

Samuel Richardson	1,498 00
Thomas W. Butt	*1,498 00
W. M. Shakespear	1,819 00
Trickey & Jewett	1,819 00
William White	1,926 00
S. P. Brown	6,420 00
George T. Wallace	2,140 00

Class No. 7. Yellow-pine logs:

Thomas W. Butt	8,700 00
A. H. Lindsay	6,900 00
W. M. Shakespear	6,900 00
Trickey & Jewett	*6,450 00
William White	6,900 00
S. P. Brown	10,200 00
George T. Wallace	7,050 00

Class No. 9. Yellow-pine mast-timber:

A. H. Lindsay	*2,193 84
W. M. Shakespear	3,656 40
Trickey & Jewett	3,656 40
William White	2,559 48
S. P. Brown	5,789 30
George T. Wallace	2,254 78

Class No. 11. White-pine logs:

Trickey & Jewett	*2,400 00
S. P. Brown	3,800 00

Class No. 13. White-pine plank boards:

Joseph W. Duryee	940 00
Trickey & Jewett	*800 00
Watson & Pittinger	1,480 00

Class No. 15. White ash:

Joseph W. Duryee	*$385 00
Trickey & Jewett	§385 00
Watson & Pettinger	693 00

Class No. 16. White-ash oars:

George T. Vaughan	406 24
David Babcock & Co	*383 25
George H. Creed	459 90
Watson & Pettinger	2,503 90

Class No. 18. Black-walnut, &c.

Joseph W. Duryee	4,000 00
Trickey & Jewett	*2,500 00
Watson & Pettinger	5,600 00

Class No. 32. Iron, round and square:

Spalding & Parrott	790 00
Hyatt & Spencer	721 00
David Babcock & Co	873 00
George H. Creed	775 00
John Williams	*691 00
Joseph L. Savage	846 25

Class No. 33. Iron, flat:

Spalding & Parrott	1,048 00
Hyatt & Spencer	981 85
George H. Creed	1,012 50
John Williams	*931 20
Joseph L. Savage	1,172 00

Class No. 34. Iron, plate:

Hyatt & Spencer	†3,190 42
David Babcock & Co	*3,565 53
George H. Creed	3,633 26
Joseph L. Savage	3,825 74

Class No. 35. Steel:

Spalding & Parrott	52 00
Hyatt & Spencer	52 00
George H. Creed	52 00
Joseph L. Savage	46 00
Reese, Graff & Woods	*41 60

Class No. 37. Iron spikes:‡

Spalding & Parrott	325 00
Hyatt & Spencer	362 50
David Babcock & Co	350 00
George H. Creed	395 00
Joseph L. Savage	312 50

Class No. 39. Iron cut nails:

James L. Parker	*108 85
Hyatt & Spencer	†108 18
George H. Creed	132 00
Joseph L. Savage	115 07

* Accepted. † Bid rejected. ‡ Class not awarded. § Decided by lot.

Class No. 42. Lead pipe, sheet:

James L. Parker	*$594 00
Hyatt & Spencer	600 00
David Babcock & Co	625 00
George H. Creed	605 00
Joseph L. Savage	655 00

Class No. 43. Zinc:

Hyatt & Spencer	1,018 75
David Babcock & Co	997 50
George H. Creed	*920 00
Joseph L. Savage	1,085 00

Class No. 44. Tin:

James L. Parker	728 00
Hyatt & Spencer	747 60
David Babcock & Co	*724 00
George H. Creed	884 00
Joseph L. Savage	798 00

Class No. 45. Solder:‡

James L. Parker	111 00
Hyatt & Spencer	102 00
David Babcock & Co	102 00
George H. Creed	105 00
Joseph L. Savage	96 00

Class No. 48. Locks, hinges:

James L. Parker	249 00
Hyatt & Spencer	141 62
David Babcock & Co	*138 50
George H. Creed	206 00
Joseph L. Savage	308 50

Class No. 49. Screws:

Hyatt & Spencer	†533 28
David Babcock & Co	621 21
George H. Creed	*572 40
Joseph L. Savage	689 35

Class No. 50. Files:‡

James L. Parker	798 47
Hyatt & Spencer	563 93
George H. Creed	951 02
Joseph L. Savage	669 52

Class No. 51. Augers:‡

Hyatt & Spencer	465 96
Joseph L. Savage	548 53

Class No. 52. Tools for stores:

Hyatt & Spencer	87 31
David Babcock & Co	*69 75
George H. Creed	112 50
Joseph L. Savage	91 00

Class No. 53. Tools for yards and shops:

Hyatt & Spencer	10,417 95
David Babcock & Co	11,548 20
George H. Creed	*9,817 30
Joseph L. Savage	11,923 10

Class No. 54. Hardware:

Hyatt & Spencer	†$627 87
David Babcock & Co	*658 40
Joseph L. Savage	913 06

Class No. 56. White-lead:

James L. Parker	*1,045 00
Hyatt & Spencer	1,112 50
David Babcock & Co	1,190 00
George H. Creed	1,125 00
Joseph L. Savage	1,250 00
Witherall & Bros	1,100 00

Class No. 58. Colored paints:

James L. Parker	*417 00
Hyatt & Spencer	†383 75
David Babcock & Co	477 95
George H. Creed	484 50
Joseph L. Savage	446 50

Class No. 59. Linseed-oil:

James L. Parker	3,500 00
Hyatt & Spencer	3,500 00
David Babcock & Co	*3,430 00
George H. Creed	3,675 00
Joseph L. Savage	3,465 00

Class No. 60. Varnish, &c.:‡

James L. Parker	249 00
Hyatt & Spencer	222 75
David Babcock & Co	244 05
George H. Creed	251 40
Joseph L. Savage	235 45

Class No. 63. Sperm and lard oil:‡

Hyatt & Spencer	746 00
David Babcock & Co	823 00
George H. Creed	780 00
Joseph L. Savage	753 00
Hastings & Co	958 00

Class No. 64. Tallow, soap:‡

Geo. T. Vaughn	215 00
Henry C. Walker	220 00
Hyatt & Spencer	210 00
David Babcock & Co	215 00
George H. Creed	300 00
Joseph L. Savage	195 00

Class No. 65. Fish-oil:‡

Geo. T. Vaughn	332 00
Hyatt & Spencer	248 00
David Babcock & Co	268 00
Geo. H. Creed	236 00
Joseph L. Savage	228 00

* Accepted. † Rejected. ‡ Class not awarded.

Class No. 69. Brushes:

James L. Parker	*$375 00
Hyatt & Spencer	441 00
Joseph L. Savage	720 62

Class No. 70. Dry-goods: ‡

Hyatt & Spencer	380 20
David Babcock & Co	426 42
George H. Creed	467 20
Joseph L. Savage	371 90

Class No. 71. Stationery:

Frost & Adams	999 35
Wm. H. Dempsey	1,182 28
Wm. Ballantyne	*978 28
P. W. Derham	1,409 55

Class No. 73. Ship-chandlery: ‡

George T. Vaughn	513 37
Hyatt & Spencer	429 80
David Babcock & Co	526 00
George H. Creed	440 00
Joseph L. Savage	377 50

Class No. 74. Acids: ‡

Hyatt & Spencer	334 40
David Babcock & Co	423 00

* Accepted.

Opened in presence of—

I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *May* 27, 1873.

Offers to furnish materials for the Navy, under the advertisement of the Bureau of Construction and Repair, of April 29, 1873, *at the navy-yard, Charlestown, Mass.*

Class No. 1. White-oak logs: ‡

Samuel Richardson	$5,500 00
Thomas W. Butt	7,000 00
W. M. Shakespear	6,000 00
Wm. White	6,600 00
S. P. Brown	7,800 00
Trickey & Jewett	6,000 00
George T. Wallace	6,500 00

Class No. 7. Yellow-pine logs:

Thomas W. Butt	5,500 00
W. M. Shakespear	4,500 00
Wm. White	4,500 00
S. P. Brown	6,800 00
Trickey & Jewett	*4,300 00
Watson & Pittinger	4,900 00
George T. Wallace	4,600 00

Class No. 16. White-ash oars:

D. Babcock & Co	*491 16
George H. Creed	567 65
George H. Creed	$571 60
Joseph L. Savage	418 34

Class No. 77. Belting, packing: ‡

Hyatt & Spencer	300 00
David Babcock & Co	332 75
George H. Creed	372 50
Joseph L. Savage	329 25

Class No. 78. Leather: ‡

Hyatt & Spencer	298 50
David Babcock & Co	325 00
George H. Creed	400 50
Joseph L. Savage	291 40
William Conn	352 00

Class 87. Bituminous coal:

John W. Deering	4,782 00
Spalding & Parrott	5,220 00
Charles E. Walker & Co.	5,250 00
David Babcock & Co	5,274 00
Con. Coal Co	*4,722 00

Class No. 88. Charcoal.

Charles E. Walker & Co.	1,475 00
David Babcock & Co	*1,045 00
George H. Creed	1,450 00

‡ Class not awarded.

Class No. 25. Lignum-vitæ:

D. Babcock & Co	*$620 00
George H. Creed	720 00
Trickey & Jewett	650 00

Class No, 32. Iron, round and square:

May & Co	*3,784 00
Loring & Wales Brothers	4,410 00
Hyatt & Spencer	† 3,755 00
John Williams	3,927 00
D. Babcock & Co	4,787 00
George H. Creed	3,985 00
Joseph L. Savage	4,835 00

Class No. 33. Iron, flat:

May & Co	1,337 00
Loring & Wales Brothers	1,796 25
Hyatt & Spencer	1,414 00
John Williams	1,372 50
D. Babcock & Co	1,692 50
George H. Creed	*1,217 00
Joseph L. Savage	1,720 00

* Accepted. † Rejected. ‡ Class not awarded.

Class No. 34. Iron plate:

May & Co	*$2,892 34
Loring & Wales Brothers	3,502 04
Hyatt & Spencer	†2,558 61
D. Babcock & Co	3,133 23
G. H. Creed	3,121 10
Joseph L. Savage	3,356 15

Class No. 35. Steel:

May & Co	*$1,743 50
Loring & Wales Brothers	2,541 00
Hyatt & Spencer	1,955 10
George H. Creed	1,826 00
Joseph L. Savage	2,114 62
Reese, Graff & Woods	1,936 00

Class No. 37. Iron spikes:

Loring & Wales Brothers	*405 00
Hyatt & Spencer	465 00
D. Babcock & Co	450 00
George H. Creed	438 75
Joseph L. Savage	429 37

Class No. 38. Iron wrought nails:‡

Loring & Wales Brothers	37 50
Hyatt & Spencer	43 50
George H. Creed	144 00
Joseph L. Savage	37 50

Class No. 39. Iron cut nails:

May & Co	627 20
Loring & Wales Brothers	645 57
Hyatt & Spencer	†574 08
D. Babcock & Co	619 60
G. H. Creed	*607 55
Joseph L. Savage	631 20

Class No. 42. Lead:

J. H. Chadwick & Co	*708 75
Hyatt & Spencer	746 25
D. Babcock & Co	763 75
George H. Creed	713 00
Joseph L. Savage	812 50

Class No. 43. Zinc:

May & Co	4,250 00
Hyatt & Spencer	4,750 00
D. Babcock & Co	4,450 00
George H. Creed	*3,800 00
Joseph L. Savage	5,062 50

Class No. 44. Tin:

May & Co	*515 00
Hyatt & Spencer	636 05
D. Babcock & Co	556 50
George H. Creed	565 00
Joseph L. Savage	611 70

Class No. 48. Locks, hinges, &c.:

May & Co	$1,242 90
Hyatt & Spencer	950 95
D. Babcock & Co	1,020 65
George H. Creed	*756 80
Joseph L. Savage	1,829 00

Class No. 49. Screws:

May & Co	50 40
Hyatt & Spencer	48 75
D. Babcock & Co	52 70
George H. Creed	*43 80
Joseph L. Savage	65 05

Class No. 50. Files:

May & Co	2,553 21
Hyatt & Spencer	2,157 85
George H. Creed	*2,063 42
Joseph L. Savage	2,661 09

Class No. 51. Augers:

Hyatt & Spencer	†2,469 15
George H. Creed	*2,741 10
Joseph L. Savage	3,014 45

Class No. 52. Tools for stores:

May & Co	908 00
Hyatt & Spencer	†551 26
D. Babcock & Co	876 50
George H. Creed	*650 00
Joseph L. Savage	703 00

Class No. 53. Tools for yard use:

May & Co	2,892 37
Hyatt & Spencer	2,687 73
D. Babcock & Co	2,986 85
George H. Creed	*2,416 93
Joseph L. Savage	3,230 70

Class No. 54. Hardware:

May & Co	3,046 09
Hyatt & Spencer	2,938 89
D. Babcock & Co	3,251 00
George H. Creed	*2,806 80
Joseph L. Savage	3,386 40

Class No. 56. White lead:

J. H. Chadwick & Co	4,100 00
D. & J. Noblit	5,200 00
Hyatt & Spencer	4,350 00
D. Babcock & Co	4,360 00
George H. Creed	*3,960 00
Joseph L. Savage	4,650 00
Witherall & Bros	4,400 00
Fahnstock & Schwartz	4,136 00

* Accepted. † Rejected. ‡ Class not awarded.

Class No. 57. Zinc:

Hyatt & Spencer	$456 25
D. Babcock & Co	§450 00
George H. Creed	*§450 00
Joseph L. Savage	468 75

Class No. 58. Colored paints:

Charles Richardson & Co	1,139 00
May & Co	*1,033 00
Hyatt & Spencer	1,070 10
D. Babcock & Co	1,083 00
George H. Creed	1,121 00
Joseph L. Savage	1,100 30

Class No. 60. Varnish, &c.:

Charles Richardson & Co	2,491 00
May & Co	2,348 50
Hyatt & Spencer	2,344 50
D. Babcock & Co	2,312 00
George H. Creed	*2,134 50
Joseph L. Savage	2,418 80

Class No. 63. Sperm and lard oil:

D. & J. Noblit	6,015 00
Thomas G. Hunt	6,000 00
Hyatt & Spencer	5,220 00
D. Babcock & Co	5,280 00
George H. Creed	*4,710 00
Joseph L. Savage	4,938 00
Hastings & Co	6,654 00

Class No. 64. Tallow, soap:‡

D. & J. Noblit	60 00
Hyatt & Spencer	33 75
D. Babcock & Co	50 00
George H. Creed	45 00
Joseph L. Savage	29 37

Class No. 65. Fish-oil:‡

D. & J. Noblit	1,290 00
Thomas G. Hunt	1,125 00
Hyatt & Spencer	900 00
D. Babcock & Co	960 00
George H. Creed	900 00
Joseph L. Savage	855 00

Class No. 68. Glass:

May & Co	*528 92
Hyatt & Spencer	559 58
D. Babcock & Co	704 95
George H. Creed	617 43
Joseph L. Savage	782 94

Class No. 69. Brushes:

May & Co	1,324 50
Hyatt & Spencer	1,254 74
D. Babcock & Co	1,398 95
George H. Creed	*1,212 75
Joseph L. Savage	1,469 15

Class No. 70. Dry-goods:

Hyatt & Spencer	$933 35
D. Babcock & Co	991 25
George H. Creed	*844 75

Class No. 71. Stationery:

John M. Whittemore & Co	1,126 72
W. H. Dempsey	1,149 41
Frost & Adams	1,122 75
Wm. Ballantyne	*1,120 62
P. W. Derham	1,290 15

Class No. 72. Crucibles:

May & Co	*361 05
Hyatt & Spencer	362 64
D. Babcock & Co	405 00
George H. Creed	416 00
Joseph L. Savage	374 00

Class No. 73. Ship-chandlery:

Hyatt & Spencer	1,400 75
D. Babcock & Co	1,537 50
George H. Creed	*990 50

Class No. 74. Acids:

Hyatt & Spencer	5,138 96
D. Babcock & Co	1,995 45
George H. Creed	*1,280 75
Joseph L. Savage	1,569 60

Class No. 75. Resin, pitch, &c.:

Hyatt & Spencer	237 50
D. Babcock & Co	235 00
George H. Creed	*224 50

Class No. 77. Belting, packing:‡

C. M. Clapp & Co	5,186 00
Hyatt & Spencer	4,347 30
D. Babcock & Co	5,575 75
George H. Creed	3,939 75
Joseph L. Savage	4,946 70
Pine & Barnum	5,332 75
Boston Car-Spring Co§	

Class No. 78. Leather:

C. M. Clapp & Co	*874 50
May & Co	887 00
Hyatt & Spencer	1,056 00
D. Babcock & Co	1,213 60
George H. Creed	876 00
Joseph L. Savage	1,148 50
Pine & Barnum	§600 00
William Conn	1,677 00

Class No. 85. Anthracite coal:

J. C. Wellington	16,200 00
D. Babcock & Co	*16,040 00
S. P. Brown	20,400 00

* Accepted. † Rejected. ‡ Class not awarded. § Decided by lot.

Class No. 87. Bituminous coal:

J. C. Wellington	$6,760 00
Con. Coal Co	6,136 00
Alex. Ray, agent	*6,080 00
D. Babcock & Co	6,912 00

Class No. 88. Charcoal:

D. Babcock & Co	$1,875 00
George H. Creed	*1,580 00

Opened in presence of—

I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *May* 27, 1873.

Offers to furnish material for the Navy under the advertisement af the Bureau of Construction and Repair, of April 29, 1873, at the navy-yard, Brooklyn, N. Y.

Class No 1. White-oak logs: ‡

Samuel Richardson	$10,000 00
Thomas W. Butt	13,400 00
A. H. Lindsay	13,000 00
Wm. M. Shakespear	11,000 00
S. P. Brown	13,800 00
Trickey & Jewett	11,000 00
Wm. White	12,400 00
George T. Wallace	12,800 00
J. Bigler & Co	11,860 00

Class No. 7. Yellow-pine logs:

Thomas W. Butt	10,400 00
A. H. Lindsay	9,000 00
Wm. M. Shakespear	9,000 00
S. P. Brown	12,600 00
Trickey & Jewett	*8,200 00
Wm. White	8,400 00
Watson & Pittinger	8,800 00
Geo. T. Wallace	9,000 00
J. Bigler & Co	8,600 00

Class No. 13. White-pine plank boards:

Joseph W. Duryee	10,585 00
S. P. Brown	13,990 00
Trickey & Jewett	*9,825 00
Watson & Pittinger	10,200 00
J. Bigler & Co	11,558 00

Class No. 15. White ash, &c.:

Joseph W. Duryee	*1,950 00
A. H. Lindsay	2,000 00
Trickey & Jewett	2,100 00
Watson & Pittinger	2,125 00

Class No. 16. White-ash oars:

G. H. Creed	760 00
D. Babcock & Co	*670 00
Watson & Pittinger	2,900 00

Class No. 18. Black walnut, &c.:

Joseph W. Duryee	$935 00
Trickey & Jewett	975 00
Watson & Pittinger	*927 00

Class No. 23. Black sprnce:

S. P. Brown	1,600 00
Trickey & Jewett	1,600 00
Watson & Pittinger	*1,460 00
Joseph Wescott	§ 1,100 00

Class No. 24. White-oak staves, &c.:

Thomas W. Butt	2,600 00
D. Babcock & Co	2,800 00
Watson & Pittinger	*2,510 00

Class No. 32. Iron, round and square:

Hyatt & Spencer	7,585 00
John Williams	7,939 00
George H. Creed	*7,462 50
D. Babcock & Co	9,660 00
Joseph L. Savage	8,750 00

Class No. 33. Iron, flat:

Hyatt & Spencer	†1,526 00
John Williams	*1,553 00
George H. Creed	1,615 00
D. Babcock & Co	1,884 50
Joseph L. Savage	1,780 00

Class No. 37. Iron spikes:

D. & J. Noblit	2,520 00
Hyatt & Spencer	2,038 75
George H. Creed	*1,890 00
D. Babcock & Co	2,100 00
Joseph L. Savage	1,965 00

*Accepted. †Rejected. ‡Class not awarded § Received too late.

Class No. 38. Iron, wrought, nails:‡

Hyatt & Spencer	$61 50
George H. Creed	195 00
Joseph L. Savage	61 50

Class No. 39. Iron cut nails:

Hyatt & Spencer	165 37
George H. Creed	*158 50
D. Babcock & Co	180 00
Joseph L. Savage	176 00

Class No. 42. Lead, pipe, sheet:

Hyatt & Spencer	1,592 00
George H. Creed	*1,471 00
D. Babcock & Co	1,632 00
Joseph L Savage	1,692 50

Class No. 43. Zinc:

Hyatt & Spencer	1.900 00
George H. Creed	*1,480 00
D. Babcock & Co	1,780 00
Joseph L. Savage	1,980 00

Class No. 44. Tin:

Hyatt & Spencer	330 80
George H. Creed	344 00
D. Babcock & Co	*302 25
Joseph L. Savage	341 75

Class No. 48. Locks, hinges, &c.:

Hyatt & Spencer	1,667 51
George H. Creed	*1,304 20
D. Babcock & Co	2,023 60
Joseph L. Savage	2,496 50

Class No. 49. Screws:

Hyatt & Spencer	1,455 10
George H. Creed	*1,388 60
D. Babcock & Co	1,502 20
Joseph L. Savage	1,880 55

Class No. 50. Files:

Hyatt & Spencer	952 11
George H. Creed	*903 50
Joseph L. Savage	1,140 14

Class No. 51. Augers:

Hyatt & Spencer	†1,749 65
George H. Creed	*1,892 85
Joseph L. Savage	2,361 40

Class No. 52. Tools for stores:

Hyatt & Spencer	88 32
George H. Creed	85 20
D. Babcock & Co	*70 80
Joseph L. Savage	130 56

Class No. 53. Tools for yards:

Hyatt & Spencer	†$758 16
George H. Creed	815 20
D. Babcock & Co	*791 36
Joseph L. Savage	1,095 34

Class No. 54. Hardware:

Hyatt & Spencer	1,684 08
George H. Creed	*1,663 80
D. Babcock & Co	1,805 60
Joseph L. Savage	2,013 10

Class No. 56. White lead:

Hyatt & Spencer	2,225 00
George H. Creed	*1,980 00
D. Babcock & Co	2,180 00
Joseph L. Savage	2,125 00
Witherall & Bros	2,200 00
Fahnestock & Co	2,056 00

Class No. 57. Zinc-paint:

Hyatt & Spencer	720 00
George H. Creed	*640 00
D. Babcock & Co	760 00
Joseph L. Savage	710 00

Class No. 58. Colored paints:

Hyatt & Spencer	1,570 60
George H. Creed	*1,333 40
D. Babcock & Co	1,690 40
Joseph L. Savage	1,559 90

Class No. 59. Linseed-oil:

D. & J. Noblit	7,560 00
Hyatt & Spencer	6,930 00
George H. Creed	*6,230 00
D. Babcock & Co	6,720 00
Joseph L. Savage	6,790 00

Class No. 60. Varnish, &c.:

D. & J. Noblit	1,304 00
Hyatt & Spencer	1,104 00
George H. Creed	*1,103 00
D. Babcock & Co	1,186 00
Joseph L. Savage	1,146 00

Class No. 63. Sperm-oil:‡

Thomas G. Hunt	2,400 00
D. & J. Noblit	2,292 00
Hyatt & Spencer	1,998 00
George H. Creed	1,908 00
D. Babcock & Co	2,040 00
Joseph L. Savage	1,884 00
Hastings & Co	2,520 00

Class No. 64. Tallow, soap:

D. & J. Noblit	164 50
Hyatt & Spencer	128 00
George H. Creed	*128 00
D. Babcock & Co	136 00
Joseph L. Savage	128 50

*Accepted. †Bid rejected. ‡Class not awarded.

Class No. 65. Fish-oil:

Thomas G. Hunt	$150 00
D. & J. Noblit	170 00
Hyatt & Spencer	119 00
George H. Creed	114 00
D. Babcock & Co	132 00
Joseph L. Savage	114 00

Class No. 68. Glass:

Hyatt & Spencer	†226 77
George H. Creed	*235 75
D. Babcock & Co	281 75
Joseph L. Savage	312 15

Class No. 69. Brushes:

Hyatt & Spencer	†719 40
George H. Creed	*752 50
D. Babcock & Co	829 00
Joseph L. Savage	1,402 15

Class No. 70. Dry-goods:

Hyatt & Spencer	799 60
George H. Creed	*733 00
D. Babcock & Co	823 65

Class No. 71. Stationery:

W. H. Dempsey	*373 20
William Ballantyne	380 35
P. W. Derham	431 05

Class No. 73. Ship-chandlery:

Hyatt & Spencer	1,064 14
George H. Creed	*975 90
D. Babcock & Co	1,147 70

Class No. 74. Acids:

Hyatt & Spencer	†110 00
George H. Creed	*116 00
D. Babcock & Co	$151 50
Joseph L. Savage	118 50

Class No. 77. Belting, packing:‡

Hyatt & Spencer	1,366 00
George H. Creed	1,114 50
D. Babcock & Co	1,687 50
Joseph L. Savage	1,575 00
Pine & Barnum	2,056 00

Class No. 78. Leather:

Hyatt & Spencer	†198 88
George H. Creed	223 60
D. Babcock & Co	*217 80
Joseph L. Savage	226 50
Pine & Barnum	226 00
William Conn	250 00

Class No. 80. Junk:‡

George H. Creed	6,700 00
D. Babcock & Co	6,700 00
Joseph L. Savage	6,350 00

Class No. 85. Anthracite coal:

A. F. Nathan	*6,666 00
D. Babcock & Co	7,420 00

Class No. 86. Semi-bituminous coal:

A. F. Nathan	3,852 00
D. Babcock & Co	4,080 00
Berwind & Bradley	*3,840 00

Class No. 88. Charcoal:

D. Babcock & Co	*1,220 00

Opened in presence of—
I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*
NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *May* 27, 1873.

Offers to furnish materials for the Navy, under the advertisement of the Bureau of Construction and Repair of April 29, 1873, *at the navy-yard, Philadelphia, Pa.*

Class No. 1. White-oak logs:‡

Samuel Richardson	$4,500 00
J. & C. Stockham	5,400 00
A. H. Lindsay	6,300 00
W. M. Shakespear	4,700 00
Trickey & Jewett	7,000 00
William White	6,200 00
S. P. Brown	7,400 00
Watson & Pittinger	6,900 00
George T. Wallace	5,975 00
J. Bigler & Co	6,250 00

Class No. 3. White-oak curve timber:

A. H. Lindsay	$564 75
W. M. Shakespear	*481 92
Trickey & Jewett	753 00
William White	602 40
S. P. Brown	2,259 00
George T. Wallace	677 70

Class No. 4. White-oak plank:

W. M. Shakespear	*4,320 00

*Accepted. †Rejected. ‡Class not awarded.

Trickey & Jewett	$6,450 00
S. P. Brown	8,440 00
Watson & Pittinger	5,670 00
George T. Wallace	5,400 00
J. Bigler & Co	6,727 50

Class No. 11. White-pine logs:

J. & C. Stockham	*1,360 00
Trickey & Jewett	1,400 00
Watson & Pittinger	1,720 00
J. Bigler & Co	1,600 00

Class No. 13. White-pine plank, &c.:

J. W. Gaskill & Sons	*7,398 00
Joseph W. Duryee	8,341 00
Trickey & Jewett	9,635 00
S. P. Brown	11,620 00
Watson & Pittinger	7,705 00

Class No. 15. White ash, &c.: ‡

J. W. Gaskill & Sons	2,032 50
A. H. Lindsay	1,412 50
Trickey & Jewett	1,590 00
S. P. Brown	1,585 00
Watson & Pittinger	2,018 00

Class No. 18. Black walnut, &c.:

J. W. Gaskill & Sons	*260 00
Joseph W. Duryee	278 00
Trickey & Jewett	300 00
Watson & Pittinger	310 00

Class No. 32. Iron, round and square:

Paul J. Field	3,937 50
Hyatt & Spencer	3,567 00
George H. Creed	*3,538 00
D. Babcock & Co	4,548 30
John Williams	3,720 20
Joseph L. Savage	4,115 00
J. B. Shannon & Co	3,653 70

Class No. 33. Iron, flat:

Paul J. Field	1,115 00
Hyatt & Spencer	988 20
George H. Creed	1,043 00
D. Babcock & Co	1,224 20
John Williams	*1,008 20
Joseph L. Savage	1,214 50
J. B. Shannon & Co	1,132 50

Class No. 34. Iron plate: ‡

Paul J. Field	488 50
Hyatt & Spencer	422 25
George H. Creed	442 00
D. Babcock & Co	435 00
Joseph L. Savage	430 50
J. B. Shannon & Co	451 10

Class No. 37. Iron spikes: ‡

Paul J. Field	$1,607 50
Hyatt & Spencer	1,531 75
George H. Creed	1,455 00
D. Babcock & Co	1,575 00
D. & J. Noblit	1,570 00
Joseph L. Savage	1,320 00
J. B. Shannon & Co	1,175 00

Class No. 38. Iron wro't nails: ‡

Paul J. Field	119 00
Hyatt & Spencer	89 50
George H. Creed	288 00
Joseph L. Savage	99 00
J. B. Shannon & Co	247 00

Class No. 39. Iron cut nails:

Paul J. Field	490 55
Hyatt & Spencer	†454 30
George H. Creed	*462 25
Joseph L. Savage	520 65
J. B. Shannon & Co	460 75

Class No. 43. Zinc:

Hyatt & Spencer	1,233 75
George H. Creed	*1,042 00
D. Babcock & Co	1,255 00
Joseph L. Savage	1,350 00
J. B. Shannon & Co	§1,495 00

Class No. 44. Tin:

Hyatt & Spencer	780 00
George H. Creed	*760 00
D. Babcock & Co	795 00
Joseph L. Savage	820 00
J. B. Shannon & Co	820 00

Class No. 48. Locks, hinges, &c:

Paul J. Field	1,123 25
Hyatt & Spencer	816 86
George H. Creed	*684 95
D. Babcock & Co	949 60
Joseph L. Savage	928 00
J. B. Shannon & Co	1,241 35

Class No. 49. Screws:

Hyatt & Spencer	1,294 30
George H. Creed	*1,249 90
D. Babcock & Co	1,468 25
Joseph L. Savage	1,647 05
J. B. Shannon & Co	1,289 85

Class No. 50. Files:

Paul J. Field	1,292 18
Hyatt & Spencer	1,026 25
George H. Creed	*1,023 49
Joseph L. Savage	1,225 21
J. B. Shannon & Co	1,284 55

*Accepted. †Rejected. ‡Class not awarded. §Received too late.

Class No. 51. Augers:

Paul J. Field	*$1,050 30
Hyatt & Spencer	†841 39
George H. Creed	1,112 00
Joseph L. Savage	1,140 63
J. B. Shannon & Co	1,089 31

Class No. 53. Tools for yards, &c:

Paul J. Field	9,437 99
Hyatt & Spencer	†6,484 79
George H. Creed	*6,514 64
Joseph L. Savage	9,706 40
J. B. Shannon & Co	8,718 97

Class No. 54. Hardware:

Paul J. Field	1,164 84
Hyatt & Spencer	†923 40
George H. Creed	*1,020 90
Joseph L. Savage	1,157 92
J. B. Shannon & Co	1,122 91

Class No. 56. White lead:

Hyatt & Spencer	1,668 75
George H. Creed	1,635 40
D. Babcock & Co	1,687 50
D. & J. Noblit	1,800 00
Joseph L. Savage	1,668 75
Witherall & Bros	1,650 00
Fahnestock & Co	*1,533 00

Class No. 57. Zinc paint:

Hyatt & Spencer	185 00
George H. Creed	*178 00
D. Babcock & Co	200 00
Joseph L. Savage	182 50

Class No. 58. Colored paints:‡

Hyatt & Spencer	527 62
George H. Creed	580 80
D. Babcock & Co	608 08
Joseph L. Savage	538 60

Class No. 59. Linseed-oil:

Hyatt & Spencer	990 00
George H. Creed	980 00
D. Babcock & Co	*970 00
D. & J. Noblit	1,080 00
Joseph L. Savage	1,030 00

Class No. 60. Varnish, &c:

Hyatt & Spencer	†740 00
George H. Creed	*780 00
D. Babcock & Co	835 00
D. & J. Noblit	901 50
Joseph L. Savage	825 00

Class No. 63. Sperm and lard oil:

Hyatt & Spencer	†339 00
George H. Creed	*343 40
D. Babcock & Co	$365 00
D. & J. Noblit	386 00
Joseph L. Savage	349 00
Hastings & Co	420 00

Class No. 64. Tallow, soap:‡

Hyatt & Spencer	29 00
George H. Creed	32 50
D. Babcock & Co	37 00
Joseph L. Savage	25 00
J. B. Shannon & Co	32 25

Class No. 65. Fish-oil:

Hyatt & Spencer	120 00
George H. Creed	*114 00
D. Babcock & Co	136 00
D. & J. Noblit	170 00
Joseph L. Savage	120 00

Class No. 68. Glass:

Hyatt & Spencer	†611 50
George H. Creed	*643 50
Joseph L. Savage	766 50

Class No. 69. Brushes:

Paul J. Field	900 55
Hyatt & Spencer	†530 45
George H. Creed	*547 50
D. Babcock & Co	701 70
Joseph L. Savage	987 73

Class No. 70. Dry-goods:

Hyatt & Spencer	†481 51
George H. Creed	*564 95
D. Babcock & Co	614 70

Class No. 71. Stationery:

W. H. Dempsey	*453 68
Ferd. Foster	470 48
William Ballantyne	475 73

Class No. 73. Ship-chandlery:

Paul J. Field	568 00
Hyatt & Spencer	†430 00
George H. Creed	*436 50
D. Babcock & Co	554 50
J. B. Shannon & Co	538 08

Class No. 74. Acids:‡

Hyatt & Spencer	106 27
George H. Creed	125 00
D. Babcock & Co	185 00
D. & J. Noblit	135 00
Joseph L. Savage	101 25

Class No. 77. Belting, packing:‡

Paul J. Field	4,411 20
Hyatt & Spencer	978 41
D. Babcock & Co	1,929 50
Joseph L. Savage	730 64

*Accepted, †Rejected. ‡Class not awarded.

Class No. 78. Leather:

Hyatt & Spencer	†$33 00
D. Babcock & Co.	*52 40
Joseph L. Savage	2,294 80
William Conn	53 50

Class No. 85. Anthracite coal:

Plaisted & McCollin	*1,891 25

Class No. 86. Semi-bituminous coal:

Plaisted & McCollin	611 00
Berwind & Bradley	*540 00

Class No. 87. Bituminous coal:

Consolidation Coal Company	$1,230 44
Plaisted & McCollin	1,246 00
Berwind & Bradley	*1,100 00

Class No. 88. Charcoal:

Paul J. Field	*435 00
D. Babcock & Co	550 00
John W. Hampton	456 00

Opened in presence of—

I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *May* 27, 1873.

Offers to furnish material for the Navy under the advertisement of the Bureau of Construction and Repair of April 29, 1873, at the navy-yard, Washington, D. C.

Class No. 1. White-oak logs:‡

S. P. Brown	$3,350 00
Trickey & Jewett	3,000 00
William White	3,000 00
Samuel Richardson	2,000 00
A. H. Lindsay	3,000 00
W. M. Shakespear	2,400 00
William D. Wise	2,250 00
George T. Wallace	2,900 00

Class No. 3. White-oak curved timber:

S. P. Brown	1,500 00
Trickey & Jewett	500 00
William White	400 00
Samuel Richardson	275 00
A. H. Lindsay	360 00
W. M. Shakespear	320 00
William D. Wise	*255 00
George T. Wallace	490 00

Class No. 4. White-oak plank:

S. P. Brown	2,015 00
Trickey & Jewett	1,875 00
William D. Wise	*1,125 00
Watson & Pittinger	1,625 00

Class No. 7. Yellow-pine logs:

S. P. Brown	2,400 00
Trickey & Jewett	1,800 00
William White	1,600 00
A. H. Lindsay	1,760 00
W. M. Shakespear	1,760 00
Watson & Pittinger	1,800 00
George T. Wallace	*1,560 00
James Bigler & Co	1,740 00

Class No. 12. White-pine mast-timber:

S. P. Brown	$2,900 00
William White	*1,028 00
Watson & Pittinger	1,090 00

Class No. 13. White-pine plank, boards:‡

S. P. Brown	14,165 00
Trickey & Jewett	11,800 00
Joseph W. Duryee	10,278 50
J. W. Gaskill & Sons	9,394 00
Watson & Pittinger	10,191 00
George T. Wallace	10,952 25

Class No. 15. White ash, &c.:‡

S. P. Brown	1,575 00
Trickey & Jewett	1,420 00
Joseph W. Duryee	1,612 50
William White	2,000 00
J. W. Gaskill & Sons	1,377 00
A. H. Lindsay	1,250 00
Watson & Pittinger	1,625 00

Class No. 18. Black walnut, &c.:

S. P. Brown	5,528 00
Trickey & Jewett	4,520 00
Joseph W. Duryee	*4,224 00
J. W. Gaskill & Sons	4,231 00
Watson & Pittinger	4,320 00
George T. Wallace	4,848 00

Class No. 23. Black spruce:‡

S. P. Brown	522 00
Trickey & Jewett	855 00

* Accepted. † Rejected. ‡ Class not awarded.

Watson & Pittinger	$710 00
Joseph Wescott	631 00

Class No. 32. Iron, round and square:

Joseph L. Savage	2,908 66
David Babcock & Co	3,223 81
George H. Creed	*2,506 14
Hyatt & Spencer	2,657 37
John Williams	2,541 46

Class No. 33. Iron, flat:

Joseph L. Savage	774 00
David Babcock & Co	860 40
George H. Creed	736 00
Hyatt & Spencer	713 10
John Williams	*677 30

Class No. 34. Iron plate:‡

Joseph L. Savage	124 00
David Babcock & Co	172 00
George H. Creed	144 00
Hyatt & Spencer	152 80

Class No. 35. Steel:‡

Joseph L. Savage	819 25
George H. Creed	878 50
Hyatt & Spencer	907 25
Reese, Graff & Woods	892 00

Class No. 37. Iron spikes:‡

Joseph L. Savage	586 50
David Babcock & Co	746 00
George H. Creed	704 25
Hyatt & Spencer	741 25

Class No. 38. Iron wrought nails:‡

Joseph L. Savage	87 00
George H. Creed	108 00
Hyatt & Spencer	85 50

Class No. 39. Iron cut nails:‡

Joseph L. Savage	911 00
David Babcock & Co	1,072 00
George H. Creed	936 20
Hyatt & Spencer	896 12

Class No. 42. Lead, pipe, sheet:

Joseph L. Savage	596 00
David Babcock & Co	574 00
George H. Creed	*557 00
Hyatt & Spencer	560 00

Class No. 43. Zinc:‡

Joseph L. Savage	57 50
David Babcock & Co	57 50
George H. Creed	65 00
Hyatt & Spencer	55 00

Class No. 44. Tin:

Joseph L. Savage	$1,440 00
David Babcock & Co	1,492 85
George H. Creed	*1,340 00
Hyatt & Spencer	1,489 40

Class No. 45. Solder:‡

Joseph L. Savage	96 00
David Babcock & Co	103 50
George H. Creed	105 00
Hyatt & Spencer	102 00

Class No. 48. Locks, hinges, &c.:‡

Joseph L. Savage	609 00
David Babcock & Co	809 50
George H. Creed	686 50
Hyatt & Spencer	702 25

Class No. 49. Screws of brass and iron:

Joseph L. Savage	553 34
David Babcock & Co	616 91
George H. Creed	*516 10
Hyatt & Spencer	520 48

Class No. 50. Files:

Joseph L. Savage	734 68
George H. Creed	*651 14
Hyatt & Spencer	†630 24

Class No. 51. Augers:‡

Joseph L. Savage	66 48
George H. Creed	68 30
Hyatt & Spencer	341 60

Class No. 53. Tools for yard use:

Joseph L. Savage	261 10
David Babcock & Co	*197 27
George H. Creed	271 43
Hyatt & Spencer	234 19

Class No. 54. Hardware:

Joseph L. Savage	2,383 10
David Babcock & Co	2,520 44
George H. Creed	*2,188 30
Hyatt & Spencer	2,428 06

Class No. 58. Colored paints, driers:

Joseph L. Savage	36 50
David Babcock & Co	35 90
George H. Creed	*35 25
Hyatt & Spencer	†32 50

Class No. 59. Linseed-oil:‡

Joseph L. Savage	472 50
David Babcock & Co	490 00

* Accepted. † Rejected. ‡ Class not awarded.

George H. Creed	$485 00
Hyatt & Spencer	497 50
D. & J. Noblit	540 00

Class No. 60. Varnish, spirits turpentine:

Joseph L. Savage	411 25
David Babcock & Co	417 75
George H. Creed	*395 75
Hyatt & Spencer	†354 25
D. & J. Noblit	§339 25

Class No. 63. Sperm and lard oil:

Joseph L. Savage	713 00
David Babcock & Co	767 00
George H. Creed	*700 00
Hyatt & Spencer	†678 75
D. & J. Noblit	837 50
Hastings & Co	938 00

Class No. 68. Glass:‡

Joseph L. Savage	480 00
David Babcock & Co	540 00
George H. Creed	540 00
Hyatt & Spencer	700 00

Class No. 69. Brushes:

Joseph L. Savage	177 00
David Babcock & Co	*166 87
George H. Creed	189 50
Hyatt & Spencer	181 63

Class No. 70. Dry-goods:‡

Joseph L. Savage	207 90
David Babcock & Co	268 30
George H. Creed	265 96
Hyatt & Spencer	235 86

Class No. 71. Stationery:

William Ballantyne	*151 86
W. H. Dempsey	*192 40
Warren Choate & Co	154 81

Class No. 73. Ship-chandlery:†

Joseph L. Savage	845 86
David Babcock & Co	961 85
George H. Creed	$891 47
Hyatt & Spencer	901 45

Class No. 74. Acids:‡

Joseph L. Savage	24 75
David Babcock & Co	42 00
George H. Creed	31 50
Hyatt & Spencer	20 25

Class No. 77. Belting, packing:‡

Joseph L. Savage	793 68
David Babcock & Co	705 68
George H. Creed	720 51
Hyatt & Spencer	621 02
Pine & Barnum	676 70

Class No. 78. Leather:‡

Joseph L. Savage	280 40
David Babcock & Co	340 20
George H. Creed	323 60
Hyatt & Spencer	299 40
William Conn	426 40

Class No. 85. Anthracite coal:‡

S. P. Brown	450 00

Class No. 87. Bituminous coal:

David Babcock & Co	11,487 00
Alexander Ray, agent	10,542 00
Consolidation Coal Company	*9,639 00

Class No. 88. Charcoal:

David Babcock & Co	1,250 00
Joseph L. Savage	550 00
John L. Moore	*450 00
William T. Clark	500 00

Class No. 89. Wood:‡

Joseph L. Savage	496 00
David Babcock & Co	640 00

Opened in presence of—
I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *May* 27, 1873.

Offers to furnish material for the Navy under advertisement of the Bureau of Construction and Repair of April 29, 1873, at the navy-yard, Norfolk, Va.

Class No. 1. White-oak logs:‡

Samuel Richardson	$16,666 66
Thomas W. Butt	23,500 00
A. H. Lindsay	25,000 00
W. M. Shakespear	22,500 00
Trickey & Jewett	$28,000 00
William White	22,250 00
S. P. Brown	37,000 00
Watson & Pittinger	34,500 00
George T. Wallace	24,500 00
J. Bigler & Co	37,250 00

*Accepted. †Rejected. ‡Class not awarded. §Informal.

Class No. 2. White-oak keels:

Samuel Richardson	$1,006 40
Thomas W. Butt	*855 44
W. M. Shakespear	943 50
Trickey & Jewett	1,258 00
William White	1,258 00
S. P. Brown	2,138 60
Watson & Pittinger	2,503 42
George T. Wallace	1,006 40

Class No. 3. White-oak curved timber:

Samuel Richardson	2,146 00
Thomas W. Butt	*2,035 00
W. M. Shakespear	2,368 00
Trickey & Jewett	2.775 00
William White	2,220 00
S. P. Brown	9,250 00
Watson & Pittinger	7,363 00
George T. Wallace	3,182 00

Class No. 8, Yellow-pine beams:

Thomas W. Butt	*2,394 45
A. H. Lindsay	2,580 68
W. M. Shakespear	3,990 75
Trickey & Jewett	3,724 70
William White	2,660 50
S. P. Brown	6,385 20
Watson & Pittinger	4,256 80
George T. Wallace	3,192 60

Class No. 9. Yellow-pine masts:‡

Thomas W. Butt	1,106 30
A. H. Lindsay	1,042 48
W. M. Shakespear	851 00
Trickey & Jewett	1,702 00
William White	1,063 75
S. P. Brown	2,553 00
Watson & Pittinger	1,684 98
George T. Wallace	1,276 50

Class No. 12. White-pine masts:

Trickey & Jewett	805 00
William White	644 00
S. P. Brown	3,864 00
Watson & Pittinger	*611 80

Class No. 13. White-pine plank, &c.:

J. W. Gaskill & Sons	*2,512 00
Joseph W. Duryee	2,695 00
Trickey & Jewett	3,410 00
S. P. Brown	2,695 00
Watson & Pittinger	2,570 00

Class No. 15. White ash, &c.:‡

J. W. Gaskill & Sons	717 50
Joseph W. Duryee	774 00
A. H. Lindsay	$480 00
Trickey & Jewett	782 50
William White	960 00
Watson & Pittinger	820 00

Class No. 16. White-ash oars:

D. Babcock & Co	*198 00
George H. Creed	202 50
Watson & Pittinger	450 00

Class No. 18. Black walnut, &c.:

J. W. Gaskill & Sons	1,159 00
Joseph W. Duryee	1,167 50
Trickey & Jewett	1,240 00
William White	1,488 00
S. P. Brown	1,492 50
Watson & Pittinger	*1,140 00

Class No. 19. Locust timber:‡

Samuel Richardson	600 00
Thomas W. Butt	750 00
Trickey & Jewett	2,000 00
William White	1,300 00
S. P. Brown	4,000 00
Watson & Pittinger	2,000 00
George T. Wallace	1,350 00

Class No. 20. Locust tree-nails:‡

Samuel Richardson	575 00
Thomas W. Butt	725 00
A. H. Lindsay	625 00
Trickey & Jewett	800 00
William White	900 00
D. Babcock & Co	2,615 00
Watson & Pittinger	1,980 00

Class No. 23. Black spruce:‡

Trickey & Jewett	2,380 00
William White	1,960 00
S. P. Brown	1,140 00
Watson & Pittinger	1,560 00
Joseph Wescott	1,380 00

Class No. 24. White oak staves, &c.:‡

Thomas W. Butt	550 00
A. H. Lindsay	47 50
D. Babcock & Co.	1,080 00
Lookin & Myers	600 00
Watson & Pittinger	1,180 00

Class No. 32. Iron, round and square:

Hyatt & Spencer	4,231 80
D. Babcock & Co	5,187 25
George H. Creed	4,219 25
Joseph L. Savage	5,216 00
John Williams	*4,124 00

* Accepted.

‡ Class not awarded.

Class No. 33. Iron, flat:

Hyatt & Spencer	$868 70
D. Babcock & Co	1,069 00
George H. Creed	932 00
Joseph L. Savage	1,069 00
John Williams	*868 00

Class No. 34. Iron, plate:

Hyatt & Spencer	711 00
Taylor, Martin & Co	770 00
D. Babcock & Co	694 50
George H. Creed	*676 00
Joseph L. Savage	685 00

Class No. 35. Steel:

Hyatt & Spencer	1,362 00
Taylor, Martin & Co	1,624 50
George H. Creed	*1,306 00
Joseph L. Savage	1,428 00
Reese, Graff & Woods	1,376 00

Class No. 37. Iron spikes: ‡

Hyatt & Spencer	381 00
Taylor, Martin & Co	400 00
D. Babcock & Co	411 25
George H. Creed	400 00
Joseph L. Savage	327 50

Class No. 38. Iron wrought nails:

Hyatt & Spencer	†102 25
Taylor, Martin & Co	112 50
George H. Creed	*105 00
Joseph L. Savage	105 50

Class No. 39. Iron cut nails:

Hyatt & Spencer	†554 40
Taylor, Martin & Co	*559 20
D. Babcock & Co	704 05
George H. Creed	604 50
Joseph L. Savage	730 25

Class No. 42. Lead, pipe, sheet:

Hyatt & Spencer	†650 00
Taylor, Martin & Co	707 50
D. Babcock & Co	707 50
George H. Creed	*664 00
Joseph L. Savage	727 50

Class No. 43. Zinc:

Hyatt & Spencer	2,887 50
Taylor, Martin & Co	2,850 00
D. Babcock & Co	2,820 00
George H. Creed	*2,520 00
Joseph L. Savage	3,187 50

Class No. 44. Tin:

Hyatt & Spencer	1,350 00
Taylor, Martin & Co	1,380 00
D. Babcock & Co	$1,365 00
George H. Creed	*1,290 00
Joseph L. Savage	1,380 00

Class No. 45. Solder:

Hyatt & Spencer	†102 00
Taylor, Martin & Co	120 00
D. Babcock & Co	§105 00
George H. Creed	*§105 00
Joseph L. Savage	111 00

Class No. 48. Locks, hinges, &c.:

Hyatt & Spencer	248 73
Taylor, Martin & Co	279 30
D. Babcock & Co	259 47
George H. Creed	*234 00
Joseph L. Savage	357 50

Class No. 49. Screws:

Hyatt & Spencer	†249 72
Taylor, Martin & Co	*276 21
D. Babcock & Co	282 40
George H. Creed	302 07
Joseph L. Savage	327 62

Class No. 50. Files: ‡

Hyatt & Spencer	151 86
Taylor, Martin & Co	180 30
George H. Creed	182 78
Joseph L. Savage	175 32

Class No. 52. Tools for ships' stores:

Hyatt & Spencer	†270 50
Taylor, Martin & Co	341 25
D. Babcock & Co	315 34
George H. Creed	*295 50
Joseph L. Savage	327 75

Class No. 53. Tools for yard use:

Hyatt & Spencer	†252 28
Taylor, Martin & Co	*283 25
D. Babcock & Co	329 30
George H. Creed	366 70

Class No. 54. Hardware:

Hyatt & Spencer	2,617 90
Taylor, Martin & Co	*2,521 55
D. Babcock & Co	2,975 65
George H. Creed	2,630 20

Class No. 56. White-lead:

Hyatt & Spencer	1,271 87
D. Babcock & Co	1,361 25
George H. Creed	1,265 00
Joseph L. Savage	1,320 00
Witherall & Bros	1,265 00
Fahnestock, Haslett & Schwartz	*1,178 65

* Accepted. † Rejected. ‡ Class not awarded. § Decided by lot.

Class No. 57. Zinc paint:‡

Hyatt & Spencer	$1,122 50
D. Babcock & Co	1,186 25
George H. Creed	1,135 00
Joseph L. Savage	1,043 75

Class No. 58. Colored paints:

Hyatt & Spencer	589 00
D. Babcock & Co	725 00
George H. Creed	*452 00
Joseph L. Savage	626 75

Class No. 59. Linseed-oil:

Hyatt & Spencer	†975 00
D. Babcock & Co	1,025 00
George H. Creed	*1,015 00
Joseph L. Savage	1,100 00
Lookin & Myers	1,150 00

Class No. 60. Varnish, &c.:

Hyatt & Spencer	†361 15
D. Babcock & Co	*409 75
George H. Creed	411 50
Joseph L. Savage	415 65
D. & J. Noblit	415 50

Class No. 63. Sperm and lard oil:

Hyatt & Spencer	†966 00
D. Babcock & Co	1,100 00
George H. Creed	*992 00
Joseph L. Savage	1,024 00
D. & J. Noblit	1,144 00
Hastings & Co	1,312 00

Class No. 64. Tallow, soap:

Hyatt & Spencer	†132 75
D. Babcock & Co	*141 00
George H. Creed	150 00
Joseph L. Savage	155 00
Lookin & Myers	164 00

Class No. 68. Glass:

Hyatt & Spencer	433 80
Taylor, Martin & Co	508 00
George H. Creed	*276 70
Joseph L. Savage	297 00

Class No. 69. Brushes:‡

Hyatt & Spencer	105 19
Taylor, Martin & Co	124 50
D. Babcock & Co	133 30
George H. Creed	129 50
Joseph L. Savage	99 75

Class No. 70. Dry goods:

Hyatt & Spencer	†28 10
Taylor, Martin & Co	80 00
D. Babcock & Co	87 00
George H. Creed	412 00
Lookin & Myers	*57 50

Class No. 71. Stationery:

W. Choate & Co	*281 61
W. H. Dempsey	330 81
Wm. Ballantyne	$285 90
Lookin & Myers	476 64
P. W. Derham	432 80

Class No. 72. Crucibles:‡

Hyatt & Spencer	477 85
Taylor, Martin & Co	545 00
D. Babcock & Co	540 00
George H. Creed	574 50
Joseph L. Savage	531 00

Class No. 73. Ship-chandlery:

Hyatt & Spencer	1,174 65
Taylor, Martin & Co	1,425 71
D. Babcock & Co	*1,110 51

Class No. 74. Acids:‡

Hyatt & Spencer	177 42
D. Babcock & Co	342 75
George H. Creed	329 00
Joseph L. Savage	215 25

Class No. 75. Resin, pitch, &c.:

Hyatt & Spencer	232 50
D. Babcock & Co	190 00
George H Creed	197 50
Lookin & Myers	*165 00

Class No. 77. Belting, packing:‡

Hyatt & Spencer	103 50
Taylor, Martin & Co	127 00
D. Babcock & Co	132 00
George H. Creed	145 00
Joseph L. Savage	133 50

Class No. 78. Leather:

Hyatt & Spencer	47 50
Taylor, Martin & Co	60 00
D. Babcock & Co	47 50
George H. Creed	62 50
Joseph L. Savage	43 00
Lookin & Myers	*40 00
William Coun	42 50

Class No. 82. Bellows:

Taylor, Martin & Co	36 00
Joseph L. Savage	24 00
Lookin & Myers	*18 00

Class No. 85. Anthracite coal:

Peters & Bros	1,708 00
D. Babcock & Co	*1,671 60

Class No. 87. Bituminous coal:

Peters & Bros	10,200 00
D. Babcock & Co	10,370 00
Alex. Ray, agent	9,945 00
Consolidation Coal Co	*9,316 00

Class No. 88. Charcoal:

Taylor, Martin & Co	*540 00
Lookin & Myers	750 00

Opened in presence of—
I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *May* 27, 1873.

* Accepted. † Rejected. ‡ Class not awarded.

*Offers to furnish material for the Navy under the advertisement of the Bureau of Construction and Repair of April 29, 1873, at the navy-yard, Mare Island, California.**

Class No. 4. Oregon pine deck-plank:

A. Powell	$11,200 00
J. E. de la Montagnie	10,400 00
S. P. Brown	10,880 00

Class No. 7. Oregon-pine logs:

A. Powell	4,657 15
J. E. de la Montagnie	4,383 20

Class No. 8. Oregon-pine beams:

A. Powell	3,773 75
J. E. de la Montagnie	3,622 80
S. P. Brown	4,226 60

Class No. 13. Sugar-pine plank, boards:

A. Powell	2,625 00
J. E. de la Montagnie	2,450 00
S. P. Brown	3,200 00

Class No. 15. White-ash redwood:

A. Powell	2,880 00
J. E. de la Montagnie	2,700 00
S. P. Brown	1,230 00
Watson & Pittinger	1,860 00

Class No. 16. White-ash oars:

Farwell & Co	1,300 00
Watson & Pittinger	4,900 00

Class No. 18. Black walnut, &c:

A. Powell	2,750 00
J. E. de la Montagnie	2,600 00
S. P. Brown	2,230 00
Watson & Pittinger	2,490 00

Class No. 24. White-oak staves and headings:

A. Powell	5,500 00
David Babcock & Co	4,100 00

Class No. 32. Iron, round and square:

Farwell & Co	5,120 00

Class No. 33. Iron, flat:

Farwell & Co	3,483 62

Class No. 34. Iron plate:

Farwell & Co	900 00

Class No. 37. Iron spikes:

Farwell & Co	$736 00

Class No. 39. Iron cut nails:

Farwell & Co	940 00

Class No. 48. Locks, hinges, &c:

Farwell & Co	1,407 60

Class No. 49. Screws of brass and iron:

Hyatt & Spencer	427 89
Farwell & Co	557 65

Class No. 50. Files:

Hyatt & Spencer	1,731 12
Farwell & Co	2,872 20

Class No. 51. Augers:

Hyatt & Spencer	1,267 06
Farwell & Co	1,235 50

Class No. 52. Tools for stores:

Farwell & Co	3,085 10

Class No. 53. Tools for yard use:

Farwell & Co	1,884 90

Class No. 54. Hardware:

Farwell & Co	2,826 65

Class No. 56. White lead:

Farwell & Co	1,237 50

Class No. 57. Zinc-paint:

Farwell & Co	525 00

Class No. 58. Colored paints, dryers:

Farwell & Co	939 25

Class No. 59. Linseed-oil:

Farwell & Co	2,500 00

Class No. 60. Varnish, spirits turpentine:

Farwell & Co	2,262 50

* No contracts made for this yard.

Class No. 63. Sperm and lard oil:

Farwell & Co	$600 00
Hastings & Co	630 00

Class No. 64. Tallow, soap:

Farwell & Co	300 00

Class No. 65. Fish-oil:

Farwell & Co	81 00

Class No. 68. Glass:

Farwell & Co	1,410 00

Class No. 69. Brushes:

Farwell & Co	534 35

Class No. 70. Dry-goods:

Farwell & Co	894 00

Class No. 71. Stationery:

W. H. Dempsey	642 61
Wm. Ballantyne	578 05
L. H. Bonestall	540 91

Class No. 72. Crucibles:

Hyatt & Spencer	$123 50
Farwell & Co	192 00

Class No. 73. Ship-chandlery:

Farwell & Co	460 51

Class No. 77. Belting, packing:

Farwell & Co	2,178 35

Class No. 78. Leather:

Farwell & Co	173 50
William Conn	215 80

Class No. 87. Bituminous coal:

A. Powell	7,620 00
George S. Hoag	6,377 00
David Babcock & Co	5,962 50

Class No. 88. Charcoal:

A. Powell	750 00
George S. Hoag	450 00

Opened in presence of—

I. HANSCOM, *Chief of Bureau.*
H. A. GOLDSBOROUGH, *Chief Clerk.*
B. T. HANLEY, *Clerk.*

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, *May* 27, 1873.

No. 11.

MARINE CORPS.

HEADQUARTERS MARINE CORPS,
Washington, October 28, 1873.

SIR: I have the honor to report that I recently made a thorough inspection of the principal marine stations, and it gave me pleasure to find the troops in a most excellent state of discipline and efficiency, and the public property under their immediate charge in good order and well cared for. The duties of marines at the several navy-yards being chiefly confined to guarding the public property, there is little occasion for that active military duty which perfects the soldier in his profession; yet the equipment, drill, and high state of discipline of the several commands were all that could be desired, and gave assurance that if ever required for more active duty, the country would not be disappointed in them. At the stations where there are permanent barracks, the quarters and grounds were in the best condition, and will require merely the ordinary repairs during the coming year to keep them so. At Annapolis and Pensacola, the troops still occupy temporary buildings belonging to the Navy proper, which have heretofore, perhaps, answered the purpose very well, yet they are but very lightly-built structures, and cannot be much longer used for the purpose without extensive repairs. At Norfolk the

men are still quartered on board the old ship St. Lawrence, which vessel I found very much in need of repairs, the decks being in such a leaky condition that, during wet weather, she is a very uncomfortable place of abode for the troops. It will require a considerable outlay to place this vessel in good order, as she requires a general and thorough overhauling. I have annually, for several years past, referred to the want of a good and permanent barracks at this station, and recur to the subject again with the hope the Department may deem it proper to invite the attention of Congress to the subject at the approaching session. This yard has again become one of the principal naval stations, and, in my judgment, should have a large and efficient force of marines at all times in readiness for service in permanent quarters within the yard, or immediately adjacent thereto. It is believed that a good and proper site within the present boundaries could be spared, without interfering with the naval operations of the yard.

The general monthly return of the corps, transmitted to the Department a few days ago, shows that there are at present 2,331 enlisted men in the corps, of which number about 1,000 are on board vessels in commission, and the remainder at the several shore stations. The corps is now 170 men short of its complement, but as recruits are readily obtained, it will soon be up to its authorized strength. Desertions have not been so numerous during the past year as heretofore, yet still a large number leave the service in this manner. The special attention of commanding officers has been called to this subject, and I am satisfied that every effort, consistent with the good of the service, has been made by them to check the evil. Recruiting officers have been enjoined to enlist none but men of good moral character and habits, so far as can be ascertained; the regulations with regard to pay, rations, clothing, &c., have been strictly conformed to, and every possible indulgence granted to the men; yet, notwithstanding all this, the crime still continues painfully frequent, and is beyond any remedy that I can apply.

The public attention seems to have been directed recently to the band of the Marine Corps, and it is now become to be generally regarded as a national band. Being at the seat of Government, it is at all times under the immediate orders of the Department, and its services are called for on all occasions of public ceremony, civic, as well as military. It is, therefore, very desirable that it should be placed upon a more respectable footing as regards its organization, pay, &c. Its numbers should be increased, and the pay fixed at such a rate that the services of first-class musicians could be at all times commanded. In deference, therefore, to the general desire of the public, I cordially commend the subject to the consideration of the Department.

The estimates for the support of the corps for the coming fiscal year have been confined to the absolute wants of the service, and are rather less in amount than those submitted for the last year.

I am, very respectfully, your obedient servant,

J. ZEILIN,
Brigadier-General and Commandant.

HON. GEO. M. ROBESON,
Secretary of the Navy, Washington, D. C.

HEADQUARTERS MARINE CORPS,
Quartermaster's Office, Washington, August 29, 1873.

SIR: I have the honor to transmit herewith duplicate "estimates of appropriations required for the service of the fiscal year ending June 30,

1875, by the Quartermaster's Department, Marine Corps. These estimates vary from those submitted for fiscal year ending June 30, 1874, as follows:

Contingencies, increased	$10,000
Clothing, decreased	46,157
Military stores, increased	2,000
Repair of barracks, increased	2,000
Rent of rooms, decreased	344
Forage, inereased	300

The aggregate amount of these estimates is $37,201 less than that asked in estimates of previous year.

I also inclose duplicate schedules of proposals received for rations, fuel, and supplies, current fiscal year.

I am, very respectfully, your obedient servant,

W. B. SLACK,
Quartermaster Marine Corps.

Brig. Gen. J. ZEILIN,
Commandant Marine Corps, Headquarters Washington, D. C.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1875, by the Quartermaster's Department, Marine Corps.

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
PROVISIONS.		
1,333 non-commissioned officers, musicians, privates, and washerwomen, 365 days, one ration per day, 486,545, at 25 cents per ration, is	$121,636 25	$121,636 25
CLOTHING.		
2,500 non-commissioned officers, musicians, and privates, at $42.15 per annum, (actual cost per contract 1873 and 1874,) is $105,375, and 1,600 watch-coats, at $10.06½ each, is $16,104, in all	121,479 00	167,636 00
FUEL.		
4,408 cords of wood, as follows: One brigadier-general, one colonel, two lieutenant-colonels, four majors, three staff majors, twelve captains, two staff captains, thirty first and second lieutenants, fourteen hundred non-commissioned officers, musicians, privates, and washerwomen, six hospitals, one armory, seven mess-rooms for officers, sixteen offices for the commandant and staff and commanding officers at posts, eight rooms for officers of the day, ten guard-rooms at barracks and navy-yards, three clothing and other supply stores. One-fourth additional on 2,400 cords, quantity supposed to be required in latitude north 36 degrees, from September 1 to April 30, 600 cords, amounting to, in all, 4,408 cords, which, at $7 per cord, is	30,856 00	30,856 00
MILITARY STORES.		
Pay of mechanics, repair of arms, purchase of accoutrements, ordnance stores, flags, drums, fifes, and other instruments	12,000 00	10,000 00
TRANSPORTATION AND RECRUITING.		
Transportation of troops and for expenses of recruiting	12,000 00	12,000 00
REPAIR OF BARRACKS.		
Repair of barracks, and rent of offices where there are no public buildings	12,000 00	10,000 00
RENT OF ROOMS.		
Hire of quarters for officers where there are no public buildings	18,000 00	16,500 00

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
FORAGE.		
Forage for public horses and for field and staff officers' horses.....	$7,500 00	$6,000 00
CONTINGENCIES.		
For freight, ferriage, toll, cartage, wharfage, purchase and repair of boats, per diem for constant labor; burial of deceased marines; stationery, telegraphing, apprehension of deserters, oil, gas, candles, repair of gas and water fixtures, water rent; barrack-furniture, furniture for officers' quarters, and for staff and commanding officers' offices, bed-sacks, wrapping-paper, oil-cloth, crash, rope, twine, carpenters' tools, tools for police purposes; purchase and repair of hose; repairs to public carryall; purchase and repair of harness; purchase and repair of hand-carts and wheelbarrows; purchase and repair of cooking stoves, ranges, &c.; stoves where there are no grates; gravel, &c., for parade grounds; repair of pumps, paving, and for other purposes.....	40,000 00	25,000 00

Respectfully submitted.

W. B. SLACK,
Quartermaster Marine Corps.

HEADQUARTERS MARINE CORPS,
Paymaster's Office, August 23, 1873.

SIR: I have the honor to submit herewith estimates for the pay of officers, non-commissioned officers, musicians, privates, and others of the United States Marine Corps for the fiscal year ending June 30, 1875.

These estimates are $17,199 less in amount than the sum appropriated for the present fiscal year.

I am, very respectfully, yours, &c.,

J. C. CASH,
Paymaster Marine Corps.

Brig. Gen. JACOB ZEILIN,
Commandant United States Marine Corps, Headquarters.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1875, by the Paymaster's Department of the United States Marine Corps.

Detailed objects of expenditure and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1874.
PAY OF OFFICERS, NON-COMMISSIONED OFFICERS, MUSICIANS, PRIVATES, AND OTHERS OF THE UNITED STATES MARINE CORPS.		
1 brigadier-general, commandant	$5,500 00	
1 colonel	4,500 00	
2 lieutenant-colonels	8,000 00	
1 lieutenant-colonel, retired	3,000 00	
4 majors	13,750 00	
2 majors, retired	4,875 00	
1 adjutant and inspector, 1 paymaster, and 1 quartermaster	10,500 00	
2 assistant quartermasters, per act of June 30, 1834, (4 Stat. at L., p. 713, secs. 4, 5.)	5,200 00	
1 assistant quartermaster, retired, per act of March 2, 1847, (9 Stat. at L., p. 155, sec. 3.)	2,100 00	
20 captains, per act of August 5, 1854, (10 Stat. at L., p. 586, sec. 1)	44,100 00	
4 captains, retired, per act of February 21, 1857, (11 Stat. at L., p. 163, sec. 1)	6,615 00	
30 first lieutenants, per act of July 17, 1862, (12 Stat. at L., p. 594, sec. 2)	52,500 00	
30 second lieutenants, per act of June 20, 1864, (13 Stat. at L., p. 144, sec. 1)	44,100 00	
2 second lieutenants, retired, per act of March 3, 1865, (13 Stat. at L., p. 487, sec. 1.)	2,100 00	
1 sergeant-major, 1 quartermaster sergeant, and 1 drum-major, per act of July 28, 1866, (14 Stat. at L., p. 337, sec. 13.)	1,080 00	
1 leader of the band, per act of July 28, 1866, (14 Stat. at L., p. 422, sec. 37)	948 00	
50 first sergeants, at $27 per month, per act of March 2, 1867, (14 Stat. at L., p 517, sec. 1.)	16,200 00	
140 sergeants, 90 at $17 and 50 at $22 per month, per act of March 2, 1867, (14 Stat. at L., sec. 7.)	31,560 00	
180 corporals, 130 at $15 and 50 at $20 per month, per act of July 15, 1870	35,400 00	
30 musicians of the band, 7 at $40, 8 at $26, and 15 at $23 per month, per act of May 15, 1872, (secs. 1, 2, 3, 4.)	9,996 00	
96 drummers and fifers, 50 at $13 and 46 at $18 per month	17,726 00	
2,000 privates, 1,000 at $13, 500 at $16, and 500 at $18 per month	360,000 00	
9 clerks to brigadier-general commandant, adjutant and inspector, quartermaster, and paymaster.	12,883 00	
1 messenger at headquarters	971 00	
1 clerk and 1 messenger in assistant quartermaster's office, Philadelphia	1,576 00	
1 hospital-steward at headquarters	750 00	
Undrawn clothing	25,000 00	
Allowance to officers traveling under orders unaccompanied by troops	8,000 00	
Postage on public mail-matter	1,200 00	
Printing and binding under direction of Congressional Printer	300 00	
	730,440 00	$747,639 00

Respectfully submitted.

J. C. CASH,
Paymaster Marine Corps.

HEADQUARTERS MARINE CORPS,
Paymaster's Office, August 23, 1873.

ABSTRACT OF OFFERS RECEIVED FOR FURNISHING RATIONS, FUEL, AND SUPPLIES TO THE UNITED STATES MARINE CORPS, UNDER THE COGNIZANCE OF THE QUARTERMASTER'S DEPARTMENT.

Offers for rations, under advertisement dated April 24, 1873.

	Per hundred.
At Portsmouth, N. H.:	
Henry M. Clark	$28 00
Samuel J. Gerrish	29 50
Samuel Gamage	27 65
N. F. Mathes	*23 50
Nathan Baum	35 40
John C. Gilbert	26 75
Hall & Hume	$23 53
Kimberly Bros	34 00
At Charlestown, Mass.:	
Samuel J. Gerrish	34 50
Samuel Gamage	25 45
N. F. Mathes	23 50

*Accepted.

	Per hundred.
James J. Convery	$27 25
Nathan Baum	35 40
Peter Higgins	*23 47½
John C. Gilbert	24 75
Hall & Hume	23 50
Kimberly Bros	32 50
At Brooklyn, N. Y.:	
Samuel J. Gerrish	33 50
Samuel Gamage	24 45
N. F. Mathes	24 75
Walter Reckless	24 90
James J. Convery	25 75
Nathan Baum	34 60
John C. Gilbert	*22 42½
Hall & Hume	22 45
Kimberly Bros	31 80
At Philadelphia, Pa.:	
Samuel Gamage	23 45
N. F. Mathes	25 75
Walter Reckless	*21 45
Nathan Baum	34 50
John C. Gilbert	23 45½
Hall & Hume	21 50
Kimberly Bros	30 00
At Washington, D. C.:	
Samuel Gamage	18 99
N. F. Mathes	26 40
Frank Hume	18 75
Nathan Baum	30 40
John C. Gilbert	*17 43
H. W. Hall	17 44
Hall & Hume	18 43
Kimberly Bros	25 47
At Gosport, Va.:	
Samuel J. Gerrish	$36 50
Samuel Gamage	27 45
N. F. Mathes	25 30
Nathan Baum	36 15
John C. Gilbert	29 75
Hall & Hume	23 50
Kimberly Bros	*23 45
At Pensacola, Fla.:	
Hugh McHatton	26 42
T. C. Quayle	26 99
Samuel J. Gerrish	33 25
Samuel Gamage	28 00
N. F. Mathes	*26 40
John C. Gilbert	33 00
At Annapolis, Md.:	
John Kealy	22 45
Samuel Gamage	21 45
N. F. Mathes	27 75
Nathan Baum	34 20
John C. Gilbert	*21 22½
Hall & Hume	21 25
Kimberly Bros	28 00
At Mare Island, Cal.:	
John E. Williston	23 75
Wooster & Shattuck	23 60
E. J. Wilson	24 00
Samuel J. Gerrish	33 60
J. F. Tobin	25 00
Samuel Gamage	25 90
N. F. Mathes	*23 55
John C. Gilbert	34 00

Offers for fuel under advertisement dated April 26, 1873.

At Portsmouth, N. H.:

	Wood per cord.
Russell & Odion	*$10 90
	Coal per ton.
Russell & Odion	11 60
Jos. Lise	11 75
J. A. Walker	†11 50

At Charlestown, Mass.:

	Wood per cord.
Samuel Knight	*12 00
	Coal per ton.
Samuel Knight	*8 25

At Brooklyn, N. Y.:

	Wood per cord.
C. M. Felt	*9 11
A. F. Nathan	10 25
	Coal per ton.
C. M. Felt	*$6 73
A. F. Nathan	7 85

At Philadelphia, Pa.:

	Wood per cord.
Jas. Ballenger	*8 50
Jas. J. Convery	10 00
	Coal per ton.
Jas. J. Convery	*7 95

At Washington, D. C.:

	Wood per cord.
W. H. Barbour	6 67
Walsh & Queen	7 43
T. E. Clark & Co	*6 45
Chas. H. Bliss	7 18
Thos. Seabrook	7 50

*Accepted.

†Not accepted.

	Coal per ton.
W. H. Barbour	$6 65
Walsh & Queen	*6 37
T. E. Clark & Co	6 45

At Gosport, Va.:

	Wood per cord.
Lookins & Myers	*5 45
Peters Brothers	6 50

	Coal per ton.
Lookins & Myers	8 75
Peters Brothers	*7 75

At Annapolis, Md.:

	Wood per cord.
Jno. Kealy	*7 50
J. H. Broughton	8 00
T. W. Clapen	7 90

At Mare Island, Cal.:

	Wood per cord.
Jas. McCudden	*$12 25
A. Powell	18 00

	Coal per ton.
Jas. McCudden	*21 95
A. M. Ebbetts	23 40
A. Powell	33 00

At Pensacola, Fla.:

	Wood per cord.
Hugh McHatton	*5 48
T. C. Quayle	6 47
H. C. Anderson	6 00

Offers for supplies under advertisement dated May 1, 1873

Class No. 1. Kerseys, &c.:

Wm. Mathews	$54,618 00
Peter Higgins	56,950 00
Devlin & Co	64,980 00
Donald McLellan	52,890 00
R. S. Allen	*41,170 00
Allan Cameron	50,530 00
Glenham Co	†24,530 00

Class No. 2. Flannels, &c.:

Wm. Mathews	*19,931 00
Geo. Fling	†1,215 00
Nichols, Price & Co	†1,260 00
Devlin & Co	25,537 50
Donald McLellan	24,453 00
Allan Cameron	23,650 00

Class No. 3. Linens, &c.:

Wm. Mathews	*10,650 00
Devlin & Co	11,030 00
W. J. McGucken	†8,400 00

Class No. 4. Uniform-caps, &c.:

Walton Brothers	6,627 00
Geo. D. Putnam	†3,375 00
Bent & Bush	‡5,756 00

Class No. 5. Military equipments:

Walton Brothers	‡$900 70
Horstmann Bros. & Co	‡1,553 95
W. S. Hansell & Sons	†206 30
Paul I. Field	†607 75

Class No. 6. Bootees:

Jno. Mundell	20,400 00
C. R. Williamson	15,440 00
Geo. W. Randall	13,120 00
T. Pratt Potts	19,840 00
Walton Brothers	*12,800 00
J. Freeman & Co	18,320 00
Jacob Roedel & Sons	14,320 00

Class No. 7. Knapsacks, &c.:

Walton Brothers	‡4,101 00
T. A. Sloan	5,865 00
Horstmann Bros. & Co	‡62 50
S. H. Condict & Co	5,321 50

Class No. 8. Making and trimming clothing:

Wm. Mathews	33,511 00
W. A. Howell & Co	§26,049 80
Jacob Reed	22,994 75
Chas. Barnum	20,952 50
Devlin & Co	41,019 50
R. S. Allen	*18,340 50
Brantley & Leach	32,077 50

* Accepted. † Part of a class. ‡ Accepted for part of a class. § Informal.

W. B. SLACK,
Quartermaster Marine Corps.

HEADQUARTERS MARINE CORPS,
Quartermaster's Office, Washington, August 29, 1873.

No. 12.

DARIEN EXPEDITION.

REPORT OF THE SURVEY OF THE ISTHMUS OF DARIEN FOR 1873, BY COMMANDER THOS. O. SELFRIDGE, UNITED STATES NAVY.

NAVY-YARD, BOSTON, *June* 12, 1873.

SIR: I have the honor to lay before you my report of the operations of the expedition under my command for the further survey of the Isthmus of Darien.

In obedience to your order I commenced the necessary preparations in December last; and on the steamer of January 1 "for Aspinwall," were embarked the officers detailed to accompany me: Lieutenants Collins, Eaton, Sullivan, and Assistant Paymaster Ring, with the necessary provisions, material, and instruments. I was myself prevented by illness from leaving for the Isthmus until the following steamer on January 10.

From the reports and maps of the expeditions of 1870 and 1871, it will be seen that the survey of the Darien Isthmus had been completed as far south as the Napipi River, and the appearance of the country in the valley of the latter, as far as our time permitted us to explore, gave the promise of most excellent results. We were encouraged, therefore, in the hope that a more extensive and detailed exploration would justify the time employed, and return a gratifying success.

It will not be out of place here to repeat what has been the general plan of all these surveys, for it is upon this basis that I feel confident in deciding that no portion of Darien possible for a ship-canal has been left unvisited.

The density of the tropical growth is such that any survey cut blindly through its forests would indicate but little knowledge beyond a few hundred feet aside of the surveyor's path. It became a question, then, what course to adopt, and I was led to this plan by the advice of Commodore Ammen, who has given much time and matured thought to the great problem of a ship canal, and may be regarded as the pioneer of the work which I have been so fortunate as to be called upon to carry out.

With the simple law that water seeks always the lowest level, it follows that, having obtained the elevation of a water-course or river, you have the lowest level of the whole region drained by such rivers. And I would endeavor to particularly impress this feature of these surveys, for upon it rests the assumption that there is no portion of the Darien Isthmus as favorable for the construction of the ship-canal as the valleys of the Napipi and Doguado.

An examination of the general map of the Isthmus will show that the Cordilleras skirt the Atlantic coast as far as Cape Tiburon, and not only from the deck can no pass be seen, but the examination of the little rivers proved conclusively that they drained only the Atlantic slope, a fact that received an additional corroboration from the reports of Indians and traders.

There is but one exception, the Mondinga River, which empties into San Blas Bay at the narrowest part of the Isthmus. Here the Cordilleras recede, and the dividing range being afterward, as appeared, hid by an intervening ridge through which the Mondinga, by a series of falls, had forced itself, seemed very much depressed, and for a long time gave sanguine hopes of success.

The Pacific slope, as shown on the general map of the Isthmus, is

drained by two large rivers, the Chucunagua and Bayamo, both rising in a transverse spur of the Cordilleras, and therefore indicating that only in the region adjoining their lower portions could be found a sufficiently low elevation for our purpose. A careful study of the Isthmus map indicates pretty thoroughly those portions where explorations should be conducted, and have all been examined by the spirit-level or carefully recorded barometrical observations.

The Cordilleras, as has been remarked, recede from the Atlantic coast at Cape Tiburon, and running about south-southwest strike the west coast at Cape Marzo, at which point, and as far as Solam Point, the dividing range rises almost perpendicularly from the ocean. The Atrato now becomes the drainer of the eastern slope, as is the river Tuyra that of the western.

It was reasonable to hope that the valley of the latter, with a line leaving it at a moderate elevation and running east so as to strike the great river Atrato at a low level and but a short distance from the sea, would be found adapted to our wants. But such was not the case, owing to no very high elevations, but to the hilly nature of the country bordering upon the Tuyra, which made the estimate of excavation enormous.

Continuing south we come to the valley of the Truando, which, thoroughly surveyed by the combined Army and Navy expeditions of Michler and Craven, required no further explorations.

The next point that presented itself, on account of the very short distance between the Atrato, which is to this point navigable for the largest ships, and the Pacific, was the valley of the Napipi. The severe labors imposed upon the members of the expedition of 1871 left me no time to examine thoroughly this river, though my reconnaissance of it left such favorable impressions that I was not willing to abandon it, and had given me a conviction that here was the favored spot for the location of the great enterprise.

Information received from what was then supposed reliable sources, also pointed to the next tributary south of the Napipi, known as the Bojoya, as being generally lower than the Napipi.

Here, then, lay the work of the expedition of 1873, and its completion would exhaust the profitable region to be explored, and enable me to report to the Department that the surveys of the Darien Isthmus for an interoceanic canal were finally and entirely finished.

As our operations would be carried on from the Pacific shore, you were pleased to detail the Tuscarora, Commander Belknap, to co-operate with me, and he did all in his power to render the expedition successful.

The region to be explored being confined in extent, did not require as large supplies of provisions, materials, and laborers as upon former expeditions, though the work, being of the same nature, was equally harassing. I had supplied generally the same kind of food as before, adding, however, the article of corn-meal put up in tin canisters, which, from its nutritious properties, and the variety of ways in which it could be cooked, even with our rude camp apparatus, was greatly relished, and I can heartily recommend it as a valuable article of food to any future explorers.

I proposed to use the gradienter only upon our surveys. This unique instrument, described in a former report, furnished by Wurdeman, of Washington, proved to be all that I had expected, and enabled us to keep our parties down to the minimum in numbers, a very necessary requirement when every article and every pound of food had to be car-

ried on the backs of our sailors, there being no inhabitants except a few scattering Indians.

It not being possible to obtain any natives at Panama, and it having been represented to me that they could perhaps be procured at a little town called Valle, about thirty miles south of Cupica Bay, at the mouth of a small river called the Bahia, we sailed from Panama on Thursday, January 23. The wet season had proved very late, and up to this time the rains had not entirely ceased.

Valle comprises only a few huts, inhabited by Indians and a few peons who are employed by the head-men of the place, a mulatto named Gonzaloz, in collecting "tagna," or ivory-nuts, which is the sole article exported from the place. It required a great deal of palaver to engage even a man to go with us, the Indians being afraid, and the peons were mostly away; and it was not till Tuesday, the 28th, that we were able to leave, having engaged three negroes, two Indians, and a castaway sailor. No better proof of the general healthiness of this part of the coast can be given, than the fact that this sailor, named Paul, and a German whom we found here, had lived in this place six years and had never had but a single attack of fever.

COMMENCEMENT OF OPERATIONS.

As has been here stated, the objective point of the expedition was the easternmost indentation in the coast line, and it was also desirable to anchor as near as possible to the head-waters of the Bojaya River, the survey of which would occupy the largest portion of our time and force.

The most eastern point was not hard to find, but it was impossible for us to tell which was the nearest position to the Cuia or Bojaya Rivers. On this account we sailed first to Limon Bay, where I landed one of our peons named Alvarez, and his *companero*, with orders to go down the Napipi, then to cross over to the Cuia River and obtain an Indian guide to show them the trail over the hills to the Pacific.

The Tuscarora then steamed about seven miles south of Limon Bay to the most eastern point, near the mouth of a small river called Chiri-Chiri, which gives the name to the bay in which we anchored.

Desiring to lose no time, I sent Lieutenants Eaton and Sullivan out with our best Indian, Richardo, to endeavor to find the trail leading over the divide. Upon their return they reported the Indian had been able to find the trail, though it was very blind, and that in an hour's walk from the ship they had struck the head-waters of a river which I supposed then was the Cuia, but which proved to be the Doguado.

Without waiting any further intelligence from Alvarez, I ordered Lieutenant Collins to organize his party No. 1, consisting of himself and Midshipman Galt, with four sailors and four macheta-men. They landed January 31, with two weeks' provisions, established Camp No. 1 at the mouth of the Chiri-Chiri, and commenced work in the afternoon from bench-mark No. 1, cut on a cocoanut-tree growing on the beach at the edge of high water.

Party No. 1 at the end of the first day struck the foot of the dividing ridge, and the line was run up a very steep spur over the Indian trail, rising in many places at an angle of 70°, and so steep that often the foresights would not be over 5 feet in length.

The following week Camp No. 2 was established on the Doguado, and the provisions and material were transported to it after a great deal of hard work on account of the extreme steepness of the ascent.

The divide between the sea and the Doguado at its highest point was

found to be 758 feet, though more to the northward, near the headwaters of the Chiri-Chiri, it was evidently much lower, but we could not level over it on account of the steepness of the hill-sides.

In the mean while Alvarez had returned from the Cuia, with an Indian named Pedro. From him I was enabled to obtain a better-defined knowledge of the country. I found that the river near the coast was called the Turcundo, and that it joined the Cuia at a point about twelve miles distant from the beach.

In a personal reconnaissance I found it would be impossible to carry the survey over the Indian trail beyond Camp No. 2, as it led over a ridge 1,900 feet high, and there was but one place where water could be procured in a distance of eight miles. I therefore ordered Lieutenant Collins to strike an east-southeast course from Camp No. 2 to the Turcundo, and, as the position of the river was uncertain, to send out reconnoitering parties, in which duty he was assisted by Lieutenant Sullivan, to find the lowest ascent.

The work of transporting their camp material and provisions with that of the survey over this very rugged country was so severe on this little party that it became necessary to strike the river as soon as possible, where I hoped to be able to use canoes for the purpose of transportation. Some peons I dispatched to bring light canoes up the Turcundo came back and reported that on account of impassable falls it was impossible to do so.

Not knowing how far I should have to work down the Turcundo to get to our canoes, I at first made up my mind to abandon the line and commence again on the Indian trail. Still I was loth to do this, because nothing is more discouraging to men engaged in this work than to turn back and go over ground gained only by severe labor.

Upon visiting party No. 1 at their camp on the Turcundo, and after receiving a report of a reconnaissance of the river below, I determined to allow the survey to go on. As it turned out, a very fortunate conclusion, for my after-experience of the Indian trail over the country to the Cuia proved that a survey of it would have been painfully slow and laborious, owing to the very rugged country and the lack of water.

Upon my return to the ship, party No. 2 was organized, composed of Lieutenant Eaton, in charge, Lieutenant Sullivan, Midshipman Miles, and four sailors, with the necessary number of natives.

It had been my original intention to have had two parties under the above lieutenants, but the difficulty of supplying them with provisions and keeping up communication when widely separated compelled me to consolidate our means, an arrangement, as it proved, which was decidedly for the best.

While these several operations were in progress I dispatched a native carrier across the Napipi trail to my agent, Don Carlos Lemos, at Vijia, to send me a number of canoes and men to the junction of the Ciua and Turcundo Rivers. These Atrato men are athletic, industrious, and docile, and were, by far, the best help that I have employed on the Isthmus. In the event of building a canal probably one thousand of them could be gathered for that purpose, and kept up to this strength. Being excellent woodsmen, they would be invaluable in the first operations of clearing the country, building roads, and preparing the ground for the necessary railway.

To subsist party No. 2 it became necessary to make a depot at the mouth of the Turcundo, where was our camp known as Camp Relief.

Let it be remembered there were no roads in this wilderness, no maps, our topographical knowledge very limited, until by degrees we were

able to map down the different ridges, rivers, and valleys. The only path was an Indian trail, rarely used, and so blind as only to be picked out by the natives of the forest. Like all such paths it led over the highest ground, making the transportation of our provisions and material a work of painful labor, and, to add to all, water was to be obtained at rare intervals. About thirteen hundred pounds was to be transported, and for this purpose Commander Belknap organized a provision-train of some sixty-five men. Including their own provisions this gave each man a load of about thirty pounds, and in a most inconvenient shape, as all our provisions were necessarily packed in water-tight kegs and boxes.

Party No. 2, Lieutenant Eaton in charge, and the provision party under Lieutenant Hubbard left the ship at noon February 19, and camped for the night at Camp No. 2 on the Doguado. The next day Lieutenant Eaton reached Camp Relief at the junction of the Cuia and Turcundo Rivers. But though this distance was but twelve miles, it took two days to get over the provisions, and the men toward the last were so worn out that they were obliged to lay down their burdens every few minutes and rest.

On the third day after their departure the provision party came straggling back, a few at a time, and their appearance was a sufficient sign of the difficulties of transportation in this rugged wilderness.

An accident happened to one of the men, named Turner, of the provision party, which filled us with grave apprehensions. Becoming too exhausted to move on to camp, he laid down on the trail. During the night, becoming rested, he attempted to regain the camp and lost his way. As soon as the fact was known at the ship a party of natives and Indians were dispatched in search, stimulated by a large reward. The search was kept up a week without any success beyond finding some of his tracks. Finally, after being given up as dead, he was brought alongside by a native after an absence of thirty-five days. It appeared he wandered for three weeks in the woods, subsisting entirely on roots, when he finally reached the sea-shore. Here, when almost exhausted, he was found by one of the natives of Cupica Village, who cared for him until he was in a condition to return.

The operations of the survey being now well under way and requiring no longer a personal supervision, I proposed to make, in person, an extended reconnaissance of the whole ground, and a running survey of the river Atrato as far as Quibdo, some one hundred and twenty miles above the Vijia Funte, up to which point the Atrato survey had been carried the year previous; for which purpose I left the ship February 25, accompanied by two Indians as guides and provision bearers, crossed the hills, and reached Camp Relief, the head of navigation, after a toilsome march of a day and a half. Here I embarked in a canoe with Lieutenant Collins, and proceeding down the Cuia and Bojaya Rivers arrived at the Atrato after a passage of ten days.

I was much disappointed at the aspect of the country bordering on the Cuia. Not only was the intervening region between its head-waters and the Pacific much more mountainous than the corresponding country of the Napipi, but high ranges of hills were met with, first on one bank and then on the other, not seen at all in the valley of the Napipi, and gave me no doubt of the better adaptability of the latter, though it was left to the slower operations of the regular survey to map out the difference more closely.

Arriving at the little town of Vijia Funte, on the right bank of the

Atrato, I made arrangements to embark the next morning in a large canoe, better adapted for a trip that was to last several days.

Traveling in a narrow canoe, when prolonged beyond a few days, becomes painfully laborious; even more so than a march of a corresponding distance, because one is obliged to remain in a cramped position during the day, and at night his rest must be on the split-palm floor of a native's hut.

Progress up stream is necessarily slow, and therefore there is no time to waste in putting up a tolerable shelter for the night. Propelled by the vigorous thrust of the Atrato canoe-men, and by making an early start, we averaged about thirty miles per day. Such a rate would not be possible against the current of the Atrato River, which averages from one to two and a half miles per hour, did not the boatmen avail themselves of slack-water and eddies by keeping the canoe close to the bank; and with long forked poles, called *poleneos*, it is pushed up stream, using only the paddle to direct its course. It required three days and a half to reach Quibdo, a distance of one hundred and twenty miles above Vijia Funte.

We were most hospitably received, the whole population turning out *en masse* to see *los Americanos del Norte*, their curiosity intensified to see the men whom, in their ignorance, they supposed were to build the canal at once and make Colombia the first country and Quibdo the chief city of the world, as they fondly hoped.

Two days were spent at Quibdo for a much-desired rest, and we left on our return, drifting down with the current, taking soundings every five minutes, while the traverse of the river was taken at the same time by angling between the points and noting the time of passing, the velocity of the current being found by experiment. The Atrato was found capable of ship-navigation but a few miles above Vijia, but navigable for the largest steamboats within two miles of Quibdo, where occurred the first approach to a rapid, the river spreading out with but three feet in the channel.

Our return was not marked with any particular event, and we reached the Tuscarora after an absence of nearly three weeks.

The exposure incident to so long a journey in an open canoe, together with the unhealthy condition of the Atrato Valley, caused both myself and Lieutenant Collins to be taken with a severe attack of fever, which incapacitated us for some weeks. In my absence the valley of the Murindo had been surveyed by Lieutenant Hubbard.
last bench-mark of party No. 3, which had been ordered in. This would give me three different lines of level to determine the height of the junction of the Napipi and Doguado, run by separate observers, and would prove a most excellent test of the general accuracy of the survey.

After these orders were carried out, Lieutenant Eaton was directed to bring his party back over the old Napipi trail to Limon Bay.

All the operations of the survey centering at Chiri-Chiri Bay, where the Tuscarora had removed since February 1, having been finished, we sailed for Limon Bay and arrived at our old anchorage of 1871.

Party No. 2 having completed the work above assigned them, returned to the ship at Limon Bay April 17, after an absence of seventy days.

This was the last party in the field, and their return completed the survey for this section of the Isthmus.

The survey of the Bojaya exhausted the limit of profitable territory to be explored for a ship-canal, and there now remained no portion of the Isthmus, beyond what had been unvisited, of the Darien that oro-

graphically or otherwise presented any favorable features; the Tuscarora accordingly returned to Panama, and the members of the expedition returned to the United States.

EXAMPLE OF ACCURACY OF THE SURYEY.

The position and height of the junction of the Doguado and Napipi has been determined by three separate parties, on three different lines, and affords a good illustration of the accuracy of our work.

One line by Lieutenant Collins, from Limon Bay and down the Napipi from its head-waters, gave an altitude of 140 feet.

One by Lieutenants Collins, Eaton, and Sullivan, from Chiri-Chiri Bay across to the Turcundo, down this river and the Cuia, across the Cuia to the Napipi, up the latter to the mouth of the Doguado, gave 136.5 feet.

One down the Doguado from its head-waters to its mouth gave the height of the latter 132 feet.

Here are three lines embracing nearly sixty miles of leveling, run by different parties, of a rough and mountainous country, and having an extreme difference of 8 feet. The mean, 136 feet, was taken for the true height, as shown on the profile.

The position of the same point as established by these separate parties did not vary but 1,000 feet, a hardly appreciable quantity on the map that accompanies the report of the expedition.

SUMMARY OF WORK PERFORMED BY THE DARIEN EXPEDITIONS OF 1870–1871, AND 1873.

In the northwestern portion, all the country contiguous to and the valleys of the following rivers have been surveyed either with the spirit-level or closely recorded observations of mercurial barometers: Mandinga, Samagundi, Necalagua, Carti, Centisiuegua, Bayamo, and Marmoni.

Hydrographic survey of the Gulf of San Blas, and Bayamo or Chepo Rivers to junction with Marmoni: In Central Darien, by same process, what is known as Cullen or Streim route, being the same as reported upon by Gisborne; the Caledonia or Aglamate; Aglasanigua River, called the Washington, to the mouth of the Alga; the Sassardi, Morti, Sucubti, Chucunaqua, Savanna, and Lava Rivers.

Hydrographic surveys of Caledonia and Sassardi Harbors, and Savanna and Lava Rivers: In Southern Darien, the river Atrato, from Quibdo to sea, two hundred and eighty miles. The river Tanela, known as De Puydt route. What is known as the Gorgoza, Lachaune, or Tuyra route, comprising Tuyra, Paya Cue, Terculegna, Cacurica, and Peranchita Rivers; also the valleys of the Napipi, Daguado, Murindo, Turcundo, Cuia, and Bojaya Rivers.

Hydrographic survey of Darien Harbor, Gulf of Darien, known as Columbia Harbor, and Chiri-Chiri Bay: Astronomical points were established on the Atlantic coast at Aspinwall, Cape San Blas, Isla del Oro, (Caledonia Bay,) Isla del Muerto, (Darien Harbor.) Pacific side: Panama, Chiprgana, and Purogana.

In the survey of the above, the following table will indicate concisely the amount of work performed each year:

Year.	Miles measured.	Miles leveled.	Miles surveyed; estimated.	Miles leveled by barometer.	Miles of line established.	Points established in triangulation.	Miles of lines of sounding.
1870.....	342	211	311.5	57	123.5	134	790.8
1871.....	32	61	81	81	100	50	260
1873.....	120.3	96.3	110.7	14	10	15	45
Total....	494.5	368.3	503.2	152	233.5	199	1095.8

DESCRIPTION OF THE PROPOSED CANAL ROUTE VIA THE NAPIPI AND DOGUADO VALLEYS.

Much has already been said of the nature of the country, and the difficulties to be encountered in the valley of the Napipi, in my previous report. But as the value of this route depends so entirely upon the capacity of ship-navigation of the river Atrato up to the point we leave it and cross to the Pacific Ocean by an artificial cut, I will again allude to it before proceeding to discuss the general features of the new proposed line.

Our knowledge of the Atrato is based upon a complete line of soundings run by Commander Lull the whole distance from the mouth of the Napipi to the mouth of the Atrato. For the whole distance from the Napipi to the ocean there is not so much as a rock or hill to be seen on the banks of the Atrato, a sufficient evidence of the alluvial nature of the country through which it flows, and a sufficient explanation of its great depth, now known for the first time, which seems to open to us a comparatively easy solution of the problem of a ship-canal.

No one who has visited this river and floated upon its surface as I have can but be struck with the grandeur of this mighty flow of water, and can but feel that it has been designed by the Almighty to bear a more important part in the great economy of the world's progress than the carrying of the little crafts which are now its sole navigators.

That the Atrato is entirely and wholly capable of ship-navigation to the point to which we wish to leave it, is a fact that no longer admits of any doubt.

From ocean to ocean, then, the only barriers are the half-mile of sand-bar at the Atrato's mouth, and the twenty-eight miles intervening at the mouth of the Napipi, between the Atrato and the Pacific, through which an artificial cut or canal must be made.

BAR OR OBSTRUCTIONS AT THE MOUTH OF THE ATRATO.

The Atrato spreads itself ont into a delta at least twenty miles in length, and empties itself by thirteen mouths into the sea.

The great difficulty that has been met in the permanent improvement of the mouths of all the rivers that empty into the Gulf of Mexico is the shifting character of the sands, caused by the action of the sea-swell, and which require the constant use of the dredge, while a storm of a single night may open a channel entirely different from the one in use.

While nearly all the mouths of the Atrato are exposed to this same influence, that one known as the Uraba is an exception, as it empties

into an almost land locked harbor, the surface of which is hardly ruffled. This fact gives the character of its bar a permanence which none of the others possess in the same degree. Specimens of boring at a depth of 18 feet below the surface indicated that it is composed entirely of a black and white sand, whose geological proportions are the same as the hills from which the tributaries of the Atrato flow.

I was also struck by the fact that, as soon as we crossed the bar to a point where the overflow was restrained by the growth of plants, then did the depth commence to increase, and as soon as the flow was confined by banks compact enough, to sustain vegetation, the water at once deepened to five fathoms. This action of nature, in my mind, was conclusive proof that, if the current was confined by artificial banks and the inclosed distance dredged to the required depth, that there would be a permanent channel, requiring no further outlay to keep open.

From the ten-fathom line to a depth of five fathoms, in the Uraba branch, it is about 2,500 feet. There would be required for a double row of piling the whole of this distance 10,000 trees 30 feet long and 1 foot or more diameter. Trees of the variety known as the Cedron Guallaco or Trintago, Chacajo, and Insivé, can all be cut on or near the Atrato and its tributaries. These varieties are all hard and very durable, of a specific gravity less than water, and could be therefore floated to the desired spot and driven at a cost not exceding $5 per pile.

For a channel 300 feet wide and a depth of 26 feet of water, there would require to be removed 640,000 cubic yards of material. The expense, therefore, of the required improvement at the mouth of the Atrato may be summed up as follows:

10,000 piles, at $5 each	$50,000
640,000 cubic yards material, at 50 cents per cubic yard	320,000
	370,000
25 per cent. increase, for contigencies	92,500
Total	462,500

FROM THE MOUTH OF THE NAPIPI TO THE PACIFIC.

The new proposed route for the canal, as surveyed in 1873, embraces a portion of the same line as surveyed and reported upon in 1871. It starts from the Atrato, about three miles below the mouth of the Napipi, and runs almost due west, and never at a distance of more than half a mile from the river till near the mouth of the Doguado. Up to this point there are no rivers to cross, and but four small hills, none over 60 feet in height. The canal then bends with a gentle curve toward the river, and crosses the Napipi just below the junction of the Doguado. It follows close to the right bank of the latter, in a general southwest direction, and enters the Pacific Ocean at the mouth of a small stream called the Chiri-Chiri, which gives the name to the bay which will form the western terminus.

The total length of the whole is twenty-eight miles. That portionof, the line that follows the valley of the Napipi has been already described and it is only necessary to remark that as a locality there could be nothing better desired, being one continuous plain with a gradual rise of 90 feet.

From the mouth of the Doguado the country continues flat for two miles, with a gradual rise of 60 feet. We now strike broken country, with here and there small hills, increasing in height to 400 feet at about three and a half miles from the Pacific, at which point the tunnel com-

mences and is continued for three miles, passing under the divide, which is about 660 feet above the sea. Beyond the western end of the tunnel, we have the valley of the Chiri-Chiri.

The head-waters of the Doguado is a charming country, embracing a large extent of table-land, well watered and timbered, and abounding in game. Here will be a beautiful and healthy spot for the hospitals, swept by rarefied breezes at an elevation of 600 feet above the sea.

HARBORS.

The magnificent harbor at the mouth of the Atrato, named by the expedition Columbia Harbor, has already been described in a previous report. Ten miles deep by five wide, with a uniform depth of ten fathoms, completely land-locked and easy of access, it has no superior.

On the Pacific the western terminus is on the bay of Chiri-Chiri. It is open to the west and southwest, but its shores are bold and clear of reefs, and has good holding-ground of clay in 20 fathoms about three-fourths of a mile from the beach.

To protect the mouth of the canal from the ocean-swell I propose to construct two short breakwaters. Their cost will be but trifling, because they will be made of the *débris* dumped from the western face of the tunnel, which will be the easiest and cheapest way to get rid of it.

An American sailor who had lived many years on the coast told me that he had never seen it blow on the sea so heavy but that our ship, the Tuscarora, could have laid at single anchor; that he never knew of any gales, but that there were in the fall some squalls from off the land from the north and northeast.

LENGTH AND DIMENSIONS.

As has been said, we use the Atrato River, which is free from all obstructions, except the bar at its mouth, for one hundred and fifty miles. The artificial cut, or canal, to be excavated is twenty-eight miles in length; of this twenty-two miles are over a plain, three miles of moderately deep cutting, and three miles of tunneling.

The dimensions of the proposed canal are a depth of 25 feet, and a width at bottom, of earth, of 50 feet, and in rock of 60 feet, giving a working surface width of 70 feet, which is about the size of the Suez Canal; the sides sloping in earth, 2 horizontal to 1 perpendicular, and in rock, 1 horizontal to 4 perpendicular.

The tunnel will be 112 feet high and 60 feet wide, leaving 87 feet in the clear above the water-surface.

Three sidings will be constructed six miles apart, 2,000 feet in length, for vessels whose size will not permit them to pass each other on the canal.

Four plans of construction are proposed, as follows: Plan A, as given in the profile, with a summit-level of 120 feet, requiring altogether twenty locks; plan B, with the same summit-level, but with the bottom of canal carried but 15 feet below the grade-line, the required depth obtained by embankment 12 feet high; plan C, with a summit-level of 80 feet, requiring twelve locks; plan D, which contemplates a through cut from the Atrato River, in which case the canal would be filled from the latter river, and but three locks required at the Pacific terminus.

The only advantage of the latter would be the superabundant supply of water and the saving of time in passing through the locks; while on the other hand it would be more expensive, would not permit the

draining of the canal if desired for repairs, and, moreover, being necessarily very much below the bottom of the Napipi, would have to receive the surface drainage of the country through which it passed, which in the rainy reason might become a very great objection.

For myself I prefer plan B, as presenting the minimum of cost, and the moderate number of locks would add but little to the time necessary to pass from ocean to ocean.

The proposed size of the locks are a total length of 427 feet and a width of 54 feet, giving a clear length of 400 feet and a litt of 10 feet.

WATER-SUPPLY.

The water to fill the canal will be drawn entirely from the Napipi River, which at the summit-level will include also its two principal tributaries the Murindo and the Doguado Rivers. Its volume has been carefully, measured by cross-sections, and its flow at the point at which it will be tapped was about, April 1, 520,000 cubic feet per hour, which date may be considered the close of the dry season, as the rainy season commences during April and continues till the middle of June. From the marks on the trees indicative of high water, and an estimated velocity of two miles per hour, the volume of the Napipi at its highest stage is calculated to equal 8,000,000 cubic feet per hour. We are safe in allowing an average flow through the year of 3,000,000 per hour.

The survey across the country, which included a line of levels from the Cuia River to the Napipi, demonstrates that an aqueduct but three and a half miles long is necessary to utilize the flow of the Cuia, which in the dry season amounts to 450,000 cubic feet per hour, and which united with the Napipi will give a total supply of 23,280,000 cubic feet per day. This is a quantity far in excess of the demand required for a tonnage of three times the present amount that is estimated will use the canal, after making a liberal allowance for leakage, &c.

Should the time ever come that it would become necessary to build extra pairs of locks to accommodate a traffic beyond the resources of the canal to transport, we have the large river Opogado, which is about ten miles distant from the Napipi.

Experiments for evaporation at the mouth of the Atrato gave an average amount of about one fifth of an inch every twenty-four hours. This is a much smaller quantity than has been allowed in northern climates, but the difference is easily accounted for in the constant moist condition of the atmosphere of the Atrato Valley.

It is certainly a curious incident that the amount of evaporation as found in Captain Shufeldt's report upon the survey of Tehuantepec should have been found to be 0.19 of an inch, but 0.01 inch different from that obtained by our experiments; and therefore the evaporation in the tropics may be accurately set down at not more than two-tenths of an inch.

As will be seen farther on, in the construction of this work, after passing the first lock up to which the back-water from the Atrato will flow, the canal will be cut entirely through rock, care being taken to keep the bottom at such a distance below the grade-line as to accomplish this. On this account there can be no loss from filtration, an element in most canals that absorbs a large fraction of the water-supply.

The class of vessels that will frequent the canal are mostly of a large size. But the locks as proposed are long enough to take in at once two ships of 1,000 tons register each, one astern of the other.

Twenty lockages a day will represent a tonnage of 20,000 tons, pro-

vided each lock is filled by one or two vessels equal to 2,000 tons register; or during the year a total of 7,300,000 tons, which is three times the amount that it is calculated would at present use the canal.

With thirteen hours' daylight, and supposing that three lockages can be made in an hour, 40 lockages will represent the total amount that the canal is capable of accommodating. This would represent a carrying capacity of the canal for the year of 15,000,000, or six times the present amount of trade.

Therefore there is no doubt for the present, or at the time the canal is completed, but that the flow of the Napipi alone would be sufficient to supply the canal.

We have, therefore—

FLOW OF THE NAPIPI.

	Cubic feet.
Close of dry season	520,000
	24
Supply for twenty-four hours	12,480,000

DEMAND.

Leakage, at 3,000 cubic feet per minute	4,320,000
Evaporation, twenty-four miles of canal	288,000
Waste	1,000,000
Twenty lockages a day, equal to 20,000 tons per day	4,611,600
	10,219,600
Supply	12,480,000
Excess	2,260,400

Applying the total capacity of the canal, which, for reasons above stated, cannot probably exceed 40 lockages, through both summit-locks, we have a total:

	Cubic feet.
Forty lockages	9,223,200
Leakage, &c	5,608,000
	14,831,200
Napipi and Cuia Rivers combined flow at close of dry season	23,280,000
Excess	8,448,800

With these results there can be no doubt of a sufficiency of water for every requirement of the canal upon this route.

For the purpose of collecting the total flow of the Napipi in twenty-four hours when necessary, and to more quickly fill the summit-locks, a reservoir, of a capacity of 20,000,000 cubic feet, will be constructed between the canal and Napipi above the summit-level.

COST AND EXCAVATION.

For the purpose of obtaining the exact amount of excavation, from which can be calculated a close estimate of cost, we divide the work into four divisions, which are subdivided into twenty-seven parts.

The area of the prism at the end of each part is calculated, and the mean taken, which is multiplied by the length of the part in feet, to obtain the cubical contents. Theoretically this is correct, but practically it will give too large a quantity; but this is preferable to having too small an estimate, and allows for irregularities of ground.

To obtain the total cost of the excavation of the canal we allow 33

cents per cubic yard in earth, $1.25 and $1.75 per cubic yard in rock, and $5.35 for tunnel-work.

These estimates of cost have been furnished me by Benjamin H. Latrobe, esq., the distinguished engineer of the Baltimore and Ohio Railroad, and are believed to be fully equal to the necessities of the case.

It is proposed to employ almost entirely coolies or Chinese labor, Though the Chinese cannot do as much per capita as northern laborers, they work with more steadiness, and they could be procured, clothed, and fed at a cost not exceeding $16 per month. The Chinese are extremely quick at learning, and very shortly they would be equal to skilled labor in the handling of mining implements. They are now employed in large numbers upon the railroads of Peru and Costa Rica, and make, I am told, excellent miners, of which nature most of the work upon the canal partakes.

PLAN A.

Division No. 1.—This extends from the Atrato River to the summit-level, or from A to T, a distance of 103,900 linear feet, or about 19.7 miles, and includes eight locks, six of 10 feet, and two of 11 feet lift. This division will require a total excavation of 5,328,493 cubic yards of earth, and 7,801,998 of rock.

5,328,493 cubic yards of earth, at 33 cents	$1,758,403
7,801,998 cubic yards of rock, at $1.25	9,752,498
Estimated cost of single lock, $175,000; 8 locks	1,400,000
Total	12,910,901

Of the above estimated cost of a single lock, $50,000 are for gates and machinery. This division is excavated as far as B in earth, the remainder in soft rock and earth. The deepest cut will be 56 feet, and the average about 35 feet.

Division No. 2.—It extends from lock No. 8 to east face of tunnel, or from T to *T*, a distance of 25,640 feet, or about 4.9 miles, in which there are to be excavated 691,329 cubic yards of earth, and 4,937,619 cubic yards of rock. Owing to the harder character of the rock, and the deeper extent of the cut, the cost per cubic yard is increased to $1.75 per yard. We have, then, for total cost of this division—

691,329, at 33 cents	$228,139
4,937,619, at $1.75	8,640,833
Total	8,868,972

The deepest cut in this division is at the east face of the tunnel, and amounts to 223 feet, the least 35 feet; but the average depth will not exceed 75 feet.

Division No. 3.—This division is a tunnel 5,233 yards in length, a fraction less than three miles. Its dimensions are 112 feet in width; its sides are perpendicular for 63 feet, and the remaining 49 feet an arch. The number of square yards in a linear yard are 633.

In estimating the cost of this work, supposing the rock to be self-sustaining, I have allowed a cost of $5.25 per cubic yard. Adding to this 25 per cent. additional, as shown in the general summing up, it would give $11 per cubic yard for the first 40 feet in height, and $500 per yard for the running rectangular space—an ample sum, when compared with the cost of tunnels now under construction. The total cost of division No. 3 amounts to $17,731,232.

I have already spoken at length in my previous report of the popular prejudice against tunnels, and there is little now to be said. Tunneling is becoming now a general resort of engineers; and with the improved power-drills, and enormous force of nitro-glycerine, it is no longer looked upon as a subject to be avoided.

The very size of this ship-canal tunnel is in its favor, as the work will cost less, yard for yard, than railroad work, from the increased facilities that its dimensions give in removing the blast.

There would be three shafts probably sunk, giving eight faces to work upon, whose united length would not exceed 962 feet.

It should not be forgotten that this feature of a tunnel will permit the excavation of the most costly portion of the line to be carried on uninterruptedly, day and night; while, on portions of this or any other canal constructed in the tropics, much delay and annoyance will be caused by the great rain-fall of the wet season.

Division No. 4.—This division, which terminates at the Pacific, or from A to C, is 4,400 feet in length. There will be required about 67,882 yards of earth, and 395,993 rock, of excavation. It includes the system of twelve locks, and which would follow one immediately after the other, and possibly one of them might have to be placed in the mouth of the tunnel.

Nothing more than an approximate estimate can be given for the cost of the locks in this work. But as they are excavated in the solid rock, of which the cost is allowed, the greater portion of the expense will be in the gates, machinery, gate-walls, and miter-sills. Blocks of concrete or béton can be substituted for dressed granite at much below the cost of the latter, and it is believed the sum allowed for the locks will cover their cost.

Cost of Division No. 4.

67,882, at 33	$22,401
395,993, at $1.25	494,991
12 locks, at $150,000 a lock	1,800,000
Total	2,317,392

Total divisional cost.

Division No. 1	$12,910,601
Division No. 2	8,868,972
Division No. 3	17,731,232
Division No. 4	2,317,392
Total	41,828,497

To utilize the whole daily discharge of the Napipi in the dry season it is proposed to construct a reservoir to hold 20,000,000 cubic feet. This would require an excavation, supposing the banks raised 10 feet above the surface, 1,000 feet long by 800 feet broad, and 15 feet deep—a total of 440,000 cubic yards, which, at $1.25 per yard, would give as cost of reservoir, $550,000.

An aqueduct to connect the Cuia and Napipi Rivers would be 6,060 yards in length. Allowing $100 per linear yard for excavation and piping, it would give cost of aqueduct, $606,000.

Five hundred thousand dollars are allowed for culverts; one million dollars for construction of a narrow-gauge railroad to be used in the transportation of supplies, and as a tramway to remove the *débris;* also for the purchase of the necessary steamers on the Atrato, which would

not probably exceed two in number. One million is also allowed for the crossing of the Napipi River by the canal, and the necessary sluice-ways and conduits to the reservoir.

We have, therefore, the following—

SUMMARY OF EXPENSES.

Cost of excavation	$41,828,497
Cost of reservoir	550,000
Cost of aqueduct between Cuia and Napipi Rivers	606,000
Cost of culverts	500,000
Cost of railroad, narrow gauge	1,000,000
Crossing the Napipi River by canal	1,000,000
Grubbing and clearing	500,000
Sea-wall, Chiri Chiri Bay	200,000
Wall, Atrato River and eastern mouth of canal	25,000
Executive department	120,000
Engineer department	375,000
Pay department	90,000
Quartermaster's department	135,000
Commissary department	120,000
Hoisting and pumping engines	875,000
Medical department	80,000
Improvements at mouth of Atrato River	462,500
Twenty-five per cent. added for contingencies	12,116,749
Total	60,583,746

The above amount placed to the credit of the medical department is too small. But there will probably be a yearly revenue of $50,000 from rents of land and buildings, which would be appropriated to the support of the hospitals.

PLAN B.

This differs from the preceding so far that the bottom of the canal is carried but 15 feet below the grade-line, and embankments are formed on each side, some 15 feet high, to retain the waters of the canal; but this will only apply to division No. 1; the others necessarily remain an ordinary cut. In other respects it does not differ from plan A, except requiring one more lock.

The advantage of this plan is the minimum of cost of division No. 1, which by this method amounts to $3,891,609; or, applied to the summary of expenses as given under plan A, would place the total cost of the canal at $53,937,247.

PLAN C.

This plan employs but four locks to the summit level, and eight locks down.

Its advantage is in tapping the Napipi River lower down and having an increased supply of water, and less delay in passing through but half the number of locks.

The excavation will be necessarily much greater, and the tunnel will be 1,900 feet longer than by plans A and B.

The Napipi will yield, at the point tapped on this plan, 200,000 cubic feet per hour more than when taken as in plan A. The total cost of excavation will amount to $64,220,670, and total cost of canal in this plan will be $72,518,795.

PLAN D.

This differs from all the above in the fact that it purposes to do away altogether with locks, except the three at the western terminus, to

equalize the difference of level between the Atrato, at the point the canal leaves it, and the Pacific Ocean. It will be, therefore, a straight cut and filled from the Atrato, which has a volume in the dry season of at least 1,600 cubic feet per second.

Necessarily the excavation will be larger and the tunnel will be increased 3,900 feet, making the whole length of tunnel 3.71 miles.

The cost of excavation by this plan will amount to $81,815,320, and total cost of canal as an open cut will amount to $90,113,445.

HEALTH.

The health of the expedition of 1873 has been unexceptionably good. There were a few cases of intermittent fever, but they yielded readily to treatment.

But one man connected with the survey was lost, and he by drowning in the Atrato.

Though the work of the survey of the Isthmus of Darien has been of the most arduous nature, and necessarily required constant exposure, yet on all the expeditions, extending through three years, not a man has been lost by climatic causes, nor have the personnel of the expedition returned with impaired health.

Experience and observations have taught me that Europeans of regular habits, and abstemious in their diet, with the proper care of wearing light woolen clothing next to the skin, can live many years on the Isthmus of Darien without permanent injury to themselves.

It is a satisfaction to know that the Isthmus of Darien is no longer a doubtful land. That as far as its adaptibility for a ship-canal, that it has been thoroughly explored.

The United States has now, through the various expeditions fitted out for the purpose, the whole data to decide upon the feasibility of a project that has been the dream of centuries; and the best location for an enterprise the greatest and most important the world has yet seen.

To show the vast commerce that will flow through it, and the saving of time and distance over the old routes of Cape Horn and Cape of Good Hope, the following tables are given, as called for from the Secretary of the Treasury, by the House of Representatives, in February, 1872:

Trade of the United States with the following countries.

Countries.	Entered.		Cleared.		Total.	
	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.
West coast of Mexico	60	20,554	72	30,853	132	51,407
West coast of Central America	29	5,626	19	4,210	48	9,836
West coast of South America	148	193,393	132	166,055	280	339,448
Sandwich Islands	59	32,819	69	40,822	128	73,641
Islands Pacific	7	1,537	4	757	11	2,294
Australia, New Zealand	83	64,604	50	28,839	133	93,443
China	90	60,658	43	38,084	133	98,742
Japan	47	30,200	19	13,300	66	43,500
Dutch East Indies	23	12,908	14	13,565	37	26,473
California*	100	100,000	108	130,022	.....	230,022
Total tonnage from the United States through canal						969,006

* For year ending June 30, 1873.

Trade of Great Britain for 1870 *with the following countries.*

Countries.	Entered.		Cleared.		Total.	
	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.
United States Pacific coast*	150	308, 625	.....	70, 639	.....	379, 264
West coast of Mexico	15	5, 572	4	1, 057	19	6, 629
West coast of Central America	19	8, 196	13	6, 368	32	14, 564
Islands of the Pacific	18	15, 580	5	1, 846	23	17, 426
Chili	146	86, 281	212	125, 264	358	211, 545
Peru	257	224, 131	139	114, 589	396	338, 720
Equador	6	1, 970	6	1, 768	12	3, 738
Japan	8	3, 667	53	33, 148	61	36, 815
Australia and New Zealand	243	220. 889	338	320, 872	581	541, 771
Total tonnage from Great Britain through canal						1, 550, 472

* For year ending June 30, 1873.

Total tonnage of Germany with above countries	146, 049
Total tonnage of France with above countries	169, 259

Total tonnage that would use the canal:

United States	969, 006
Great Britain	1, 550, 472
Germany	146, 049
France	169, 259
Total	2, 834, 786

In the above estimates no account is taken of the trade of Great Britain with China and East Indies, much of which, outward bound, would seek the canal.

Comparison of times and distances between the old routes, via Cape Horn, and Cape of Good Hope, and the Isthmus of Darien.

TABLE FOR STEAMERS.

From—	To—	Time.	Distance.	Remarks.
		Days.	*Miles.*	
New York	Sidney	40	9, 970	
Do	Hong-Kong	48	12, 165	Via Honolulu.
Do	Manila	47	12, 005	Do.
Do	Shanghai	46	11, 605	Do.
Do	Yokohama	43	10, 675	Do.
Do	Batavia	51	13, 000	
Do	Honolulu	29	7, 155	
Do	Callao	15	3, 500	The same time and distance on the return passage.
Do	Valparaiso	21	5, 000	
Do	San Francisco	25	.....	
RETURN.				
Sidney	New York	42	9, 970	
Hong-Kong	do	46	11, 735	Great circle route.
Manila	do	48	12, 325	Do.
Yokohama	do	43	10, 315	Do.
Honolulu	do	29	7, 300	
Batavia	do	54	13, 120	

SAILING-VESSELS.

Outward.

Present route.				Via canal.		Gain.	
From—	To—	Distance.	Days.	Distance.	Days.	Distance.	Days.
		Miles.		*Miles.*		*Miles.*	
New York	Hong-Kong	14,930	110	12,480	83	2,450	27
Do	Shanghai	15,200	115	12,200	81	3,000	34
Do	Yokohama	15,750	119	11,550	79	4,200	40
Do	Manila	13,700	108	12,260	80	1,440	28
Do	Batavia	12,170	105	13,425	87	.....	18
Do	Sidney	12,220	105	10,480	75	2,740	30
Do	Valparaiso	9,760	93	6,510	52	3,250	41
Do	Callao	11,100	105	6,710	53	4,390	52
Do	Honolulu	14,500	121	7,400	54	7,100	67
Do	San Francisco	14,840	130	7,470	58	7,370	72
		Return.					
Hong-Kong	New York	14,660	110	11,875	87	2,785	23
Shanghai	....do	16,000	113	11,305	80	4,695	33
Yokohama	....do	16,070	114	10,370	77	5,700	37
Manila	....do	14,010	109	12,035	88	1,975	21
Sidney	....do	13,410	110	10,390	70	3,020	40
Valparaiso	....do	9,780	90	4,965	42	4,815	48
Callao	....do	11,120	100	3,690	32	7,430	68
Honolulu	....do	15,760	110	8,055	63	7,705	47
San Francisco	....do	14,970	125	5,980	50	8,990	75

In conclusion, it is a pleasure to recommend to the favorable notice of the Department Lieutenants Collins, Eaton, and Sullivan, who volunteered to accompany me on the present expedition.

The frequency with which their names appear on the pages of these reports indicates the positions of honor and trust which they have so worthily filled, and is the best evidence of the zeal and ability which they have always displayed.

To Commander Belknap and officers of the Tuscarora I am indebted for valuable assistance and co-operation, without which it would have been impossible for me to have carried on the survey.

Trusting I have met with the expectations of the Department in the execution of the original orders to survey the Isthmus of Darien for a ship-canal, delivered to me in January, 1870, I have the honor to be, sir, very respectfully, your obedient servant,

THOS. O. SELFRIDGE,
Commander, United States Navy.

Hon. GEO. M. ROBESON,
Secretary of the Navy, Washington, D. C.

No. 13.

NICARAGUA EXPEDITION.

WASHINGTON, D. C., *October* 25, 1873.

SIR: I have the honor to submit the following report of the work performed and the result obtained by the United States surveying expedition lately operating in Nicaragua:

The following naval and civil officers were attached to the expedition, viz:

Naval officers.—Commander Edward P. Sull, commanding expedition; Lieutenant Commander G. C. Schulze, Lieut. Wm. W. Rhoades, Lieut. Eugene H. C. Leutz, Lieut. Jacob W. Miller, Lieut. Jefferson F. Moser, Master John M. Hauley, Master J. B. Briggs, (United States steamer Kansas,) joined the expedition April 9; Master K. Niles, Ensign Jas. H. Bull, First Asst. Engineer Geo. M. Greene, Asst. Surg. John M. Bransford, Commander's Clerk Augustin S. McCrea, jr.

Civil officers.—Chief civil-engineer, A. G. Menocal; civil engineer, J. Foster Crowell; mineralogist, J. E. Cropsey; draughtsmen, A. Pohlers and W. V. W. Reilly.

In addition to these there were attached to the expedition several young men, with petty-officers' ratings, detailed for duty as rod-men, chain-men, and pole-men.

The following instruments and other articles of outfit were either on hand or provided, viz:

Instruments, &c.—Two engineers' transits, three levels, two gradienters, two surveyors' compasses, two delicate pocket aneroid-barometers, four mercurial mountain-barometers, one boring-apparatus for testing excavations, one current-meter, surveyors' chains and pins, watches, pocket-compasses, sounding leads and lines, drawing instruments and materials, field-glasses, &c., transit and level books, sounding-books, and necessary stationery, &c.

General outfit.—Axes, hatchets, machetas, shovels, and picks; camp-kettles and frying-pans; and for each officer and man one shelter-tent, one India-rubber blanket, one knapsack, one haversack, one canteen, one pair of leggings, one hammock, and one mosquito-net.

Five months' provisions for sixty men were prepared, put up in packages of from 35 to 60 pounds each, and so securely as not to be liable to injury from exposure to heat and moisture, and consisted of the following, viz: bacon, soup and boulli, tomato-soup, hard bread, rice, beans, sugar and coffee.

The instructions of the Department, issued in February, 1872, to Commander A. F. Crossman, and, after the death of that officer, carried out in part by Commander Chester Hatfield, required an exploration within the limits of the State of Nicaragua, to discover if possible a practicable route for an interoceanic ship-canal.

GEOGRAPHICAL DESCRIPTION.

Nicaragua, in shape a quadrilateral of very unequal sides, lies between latitude 10° 40′ north and 15° 20′ north, and between longitude 83° 00′ west and 87° 40′ west. Lake Nicaragua lies in the southwest part of the state, is about ninety miles long, and from thirty-five to forty-five miles wide. It is separated from the Pacific by a narrow strip of land at one place, viz: between Virgin Bay and San Juan del Sur, but twelve miles wide. To the northward and westward of Lake Nicaragua, with a surface-level from twenty-two to twenty-eight feet higher, lies the smaller Lake Managua, connected with the former by the Rio Tipitapa, through which, however, there is no visible flow of water at the present time, though Lake Managua has no other outlet. Lake Nicaragua discharges its waters through the river San Juan, which, leaving the lake at its southeast extremity, flows in a generally east-southeast course to the Caribbean.

The Cordillera is divided in the northern part of the state. One

branch, extending to the eastward, sends its multitudinous spurs to the coast and to the banks of the San Juan, while the other, passing to the westward of the lakes, sinks in some places into a mere range of hills. This is particularly the case near Leon, and again near Rivas. The bulk of the population and wealth of the country is in the departments bordering upon the Pacific.

The valley of the San Juan is entirely uninhabited, with the exception of the little villages of San Carlos and Castillo Viejo, clustering around the forts of the same names, and here and there a small plantation or a wood-chopper's station. Fort San Carlos is at the outlet of the lake, and Castillo Viejo some thirty-seven miles down the river, abreast the second rapids, to which, as well as the village, it gives its name.

THE PROBLEM AND ITS SOLUTION.

A glance at the map will show that any project for a canal through Nicaragua must involve the lake of the same name, not only because its water is needed at the summit-level, but because it lies in the narrowest part of the country, measuring from sea to sea.

It is quite clear that a line, more or less practicable, exists between the lake and the Caribbean, following the valley of the San Juan, and that this line is not only the lowest, but the shortest, which does exist between the two; the shortest, because the lake shore approaches nearer the coast at its outlet than at any other point, and the lowest, because if any other existed lower or as low, then would there be another outlet. This line, however, would be of no value unless a practicable line also existed between the lake and the Pacific. The attention of the explorer is therefore naturally first turned in that direction. Fortunately a great deal was already known in regard to that part of the country; and at least one line, *i. e.*, that from the mouth of the Rio Lajas to Brito, surveyed in 1850–'51 by Col. O. W. Childs, had been reported upon very favorably. The first work done by Commander Hatfield's party was, in accordance with the Department's directions, to re-survey this line. Child's description was found to be correct in the main, and his route was ever after taken as a standard of comparison for all others.

Commander Hatfield also examined, and found impracticable, the line starting from the mouth of the Rio Sapoa, ascending to the divide by the valley of that river, and terminating in Salinas Bay, on the Pacific; this line is generally regarded as the boundary between Nicaragua and Costa Rica. He had also partially examined a line indicated by Colonel Sonnenstern, the State Engineer of Nicaragua, following the valley of the Ochomogo, and having for its objective point on the Pacific the mouth of the Rio Escalante. The Ochomogo empties into the lake some thirty miles north of the mouth of the Lajas. The advent of the rainy season prevented Commander Hatfield's completing the work here, and also prevented the examination of another line to which his attention had been directed, in the immediate vicinity of Child's route, and which it was hoped would prove superior to it.

SAILING OF THE EXPEDITION.

The expedition of the present year sailed in the United States steamer Kansas, Commander A. V. Reed, from Hampton Roads, Virginia, on the 3d of December, 1872, and arrived off Greytown, (or San Juan del Norte,) Nicaragua, December 20. We succeeded in landing without

accident, and proceeded, as soon as possible, to Virgin Bay, to complete the work on that side of the lake. Arriving January 3 at Virgin Bay, we found Midshipmen Keeler, Winslow, and Hughes, United States Navy, who had been left with a steam-launch and a few men to do some hydrographic work in the lake, as the calm weather of the rainy season was particularly favorable for it. These young officers were under orders to the United States, to be examined for promotion, and we were thereby deprived of their services, which would have been very valuable.

COMMENCEMENT OF OPERATIONS.

Two parties had been organized before reaching Virgin Bay, and were ready to go into the field at once. They consisted of the following, viz:

Party No. 1.—Lieut. E. H. C. Leutze, in charge; Civil-Engineer J. F. Crowell, in charge of the transit instrument; Lieut. Jacob W. Miller, in charge of level; four petty officers; rod-men, pole-men, chain-men, &c.; one seaman; two Caribs.

Party No. 2.—Lieut. William W. Rhoades, in charge; First Assistant Engineer George M. Greene, with the transit instrument; Lieut. Jefferson F. Moser, with level; Mr. J. E. Cropsey, mineralogist; four petty officers; rod-men, pole-men, and chain-men; three seamen.

In addition to these there were required for each party twelve natives to be employed as macheteros or choppers, muleteers, and cooks. These, with pack and saddle mules, were obtained without trouble, through the kind offices of Messrs. Pedro and José Chamorro, leading merchants of Rivas; one an ex-senator, the other an ex-minister of finance of the state. Through the kindness of these gentlemen we were saved much trouble and delay in obtaining help and in supplying our other needs, and I shall ever hold them in grateful remembrance.

Don José Chamorro was, shortly after our arrival, specially commissioned by his government to aid us, but it was impossible for him to do more than he had already been doing voluntarily.

To Lieutenant Rhoades's party was assigned the work of examination of the route already referred to, which it was hoped would prove to be superior to that of Childs's. This line began at the north of the Rio del Medio, followed up its valley, crossed the divide, and descended to Brito by the valley of the Rio Grande; a small portion of it coinciding with Childs's line.

Lieutenant Leutze's party was directed to complete the examination of the Ochomogo line. Master K. Niles, with three men, was sent to Brito to establish a tide-gauge.

An American gentleman, Mr. Ran Runnels, formerly United States consul at San Juan del Sur, but now residing at Virgin Bay, kindly placed at our disposition a cottage which he owned, to be used as a store-room, draughting-room, and quarters for officers; while the cuartel, or barracks, was given to us by the agent of the government as a hospital, &c. We fortunately had but little use for it in that capacity, however. To Mr. Runnels and his estimable family we were, and had been since the landing of the first expedition, constantly indebted for hospitality and assistance of every kind in their power. The commanding officer accepted an invitation to become their guest, and received every kindness and attention which their thoughtfulness could devise. They will long continue to occupy a warm place in the heart of every officer in the expedition.

Lieutenant-Commander Schulze, the executive officer, was placed in

charge of the commissariat, as the keeping up of supplies required one of the most experienced officers. The commanding officer and the chief civil engineer were left free to move from party to party as occasion demanded.

The parties began work January 7; party No. 2 establishing their bench-mark at the lake-level, party No. 1 taking up the line on the Ochomogo, at the point where it was abandoned the previous year. Observations were taken daily at a lake-gauge at Virgin Bay, to show the amount of fall in the level of the water.

As the medio-line gave great promise at the outset, party No. 2 were directed to make their survey with great care and with considerable detail. The traverse was run with an engineer's transit and chain, and cross-sections were taken at every 500 feet, extending 500 feet either way. The levels were taken at every 200 feet or less. In the party operating upon the Ochomogo, a surveyor's compass was substituted for the transit; in other respects the instruments were the same. The line being less promising, and, in fact, scarcely promising at all, a close reconnaissance, rather than a detailed survey, was required. A few days served to show that this line was altogether impracticable. The level had reached 87 feet above the lake, although the end of the traverse was still at a distance of some miles from the divide. Reconnaissances were made in several directions by Messrs. Leutze, Menocal, Miller, and Crowell to find a lower pass than that they were now approaching, elevations being carefully measured by the aneroid barometer. It was found that the lowest pass was 225 feet above the lake-level, with a long slope on either side, making a very bad profile. There was, of course, no need of further examination. The line was accordingly abandoned, and the party removed to the banks of the Rio Gil Gonzales, some eighteen miles south of the Ochomogo, and whose valley was the only other locality where there was a possibility of finding a practicable route.

I might here add of the Ochomogo line that it had merely been indicated by Colonel Sonnenstern, as one of the localities which should be examined.

In the mean time party No. 2 were making excellent progress, the line developing well, and, except that it was longer than had been expected, (the lake-shore lines not having been correctly laid down on the maps,) it was proving quite as good as had been hoped.

On the 15th of January Colonel Sonnenstern, by order of his government, joined the expedition, giving us from that time till we left the country the benefit of his thorough acquaintance, not only with the territory but the people, and also of his personal services at all times when needed.

EXAMINATION OF NAPOLEON'S ROUTE.

Louis Napoleon, while a prisoner at Ham, wrote a pamphlet, in which he indicated a route for a ship-canal, which, after reaching Lake Nicaragua by the Valley of the San Juan, ascended by the Rio Tipitapa to Lake Managua, leaving which at its northwestern extremity it continued to the port of Realejo. The only object in carrying the line in this direction was to secure the harbor of Realejo as the Pacific terminus, opposed to which advantage were the disadvantages of the greater distance and the difference of level of the two lakes. The Department, in its instructions, deemed it proper that such examination should be made of this line as should show whether or not its advantages outweighed its disadvantages.

As the parties were now well under way with their work, the commanding officer, with Mr. Menocal, Colonel Sonnenstern, and Mr. Hawley, set out to make a reconnaissance covering the route just described. At Granada we were met by Mr. Hollenbeck, an American merchant doing business in Greytown, and president of the Nicaragua Steam-Navigation Company, (whose vessels navigate the San Juan and Lake Nicaragua,) and who, for his own purposes, desired to go over the ground which we proposed to examine.

The expedition had already been indebted to Mr. Hollenbeck for many favors, and he now added to these by offering us the joint use of a small metallic life-boat, which we gladly accepted. Mr. Hawley was seized with a sharp attack of fever, and was unable to proceed.

Colonel Sonnenstern, with our horses and mules, went by land to the head of the Lake Managua, where he was to indicate a landing by erecting a signal. The rest of us, embarking in the life-boat, proceeded to the Estero of Panaloya, sounding as we went; through the Estero to the river Tipitapa, ascending the latter until the rapids (so called, for no water flows over the rocky bed) were reached; then putting the boat onto an ox-cart, which we found at the hacienda of Pasquiel, we sent it to the upper lake; at the same time making a paced traverse from the spot where the boat was hauled out to where it was again launched, and measuring the difference of levels between the two lakes by aneroid barometers—one observer remaining at the level of the lower lake, and the other going to that of the upper one, so that we had simultaneous observations at the two points.

Embarking again, we continued our line of soundings to the head of Lake Managua, where we joined Colonel Sonnenstern, having been three days and a half on the way since leaving Granada. Colonel Sonnenstern now showed us all the low passes from the lake toward the coast, and a careful examination was made of each of the heights, being measured as before by simultaneous pairs of observations, one observer at the water's edge, at the lake side, and the other going over the line. The conclusions arrived at were as follows, viz:

To carry the canal through Lake Managua and on to Realejo or to the Gulf of Fonseco; first, there would have to be dredged a channel at least sixteen miles in length from deep water in Lake Nicaragua to the foot of the rocky portion of the Rio Tipitapa, the depth of water being now, on the average, 10, and in the deepest places but 12, feet; thence an independent canal of four miles, with three locks to lift from the level of Lake Nicaragua to that of Managua, there being a difference of level varying from 22 to 28 feet between the two lakes. Next a channel two miles in length to deep water in Lake Managua, to be dredged, the water now gradually deepening in that distance from 4 feet to 5 fathoms.

From Managua City to the western end of the lake the cordillera extends in an unbroken wall, gradually lessening in height from about 1,200 feet till it looses itself in a high plain.

Several lines were run from the lake shore to a distance of from three to five miles, leading as has been said, through the passes indicated by Colonel Sonnenstern. We found long gradual slopes with heights varying from 80 to 200 feet above Lake Managua, which of course gave, taking the mean difference of level between the two lakes, from 105 to 225 feet above lake Nicaragua, nor were we quite sure when the lowest of these levels was found that the summit had been reached.

The least distance from the lake to Realejo is some thirty miles, so that even if the profile were much better than it is, the line bears no comparison with Child's route on account of the distance alone, with-

out considering the six additional locks, three ascending and three descending, required. We found one other objection, which would of itself be fatal to the line; the geological formation of that part of the country is entirely volcanic. A line of volcanoes, nine in number, and all more or less active, extends from the lake towards Realejo, nearly parallel to, and in close proximity with, the proposed line of canal. While writing these pages news comes of the outburst of one of them, Monotombo, (whose base is washed by the waters of the lake,) accompanied by a shock of earthquake which was felt slightly as far as Virgin Bay, a distance of eighty miles. The soil and the underlying rock are so extremely porous that even in the wet season no streams flow into the lake from that side, all the rain that falls being drank up by the earth. We examined all the wells that we met, and found them from 100 to over 300 feet deep. If a canal were built through this region it would be impossible to keep it full unless it were made artificially water-tight from one end to the other, which would involve a cost equal to that of the excavation. For all of these reasons we regard the route as utterly impracticable.

In a survey made by Mr. John Baily many years since, that gentleman professed to have found a pass with but 56 feet above the lake level, but the most of his statements are found to be entirely unreliable, and this is no doubt like the rest. For example, he finds Lake Nicaragua to be 121 feet above mean tide in the Pacific, while the true difference of level is but 107 feet. Many of his other statements have been proved to be equally incorrect.

One valuable discovery resulted from our reconnaissance, which was the existence of a lime-stone quarry near Tipitapa, from which a high order of natural hydraulic lime is produced.

Returning by land, we stopped for a couple of days at Managua. We made an official visit to the president, who expressed great interest in the enterprise in which we were engaged, and offered on the part of his government all the assistance in its power. This offer we found the authorities everywhere not only instructed but fully disposed to make good, while the people, particularly the more intelligent classes, were equally well disposed towards the expedition.

While at Managua we were visited by several of the ministers of state, senators, members of congress, and other prominent gentlemen, and were serenaded by the national band, under the immediate direction of the president of congress, who was accompanied on the occasion by the minister of foreign affairs.

We were enabled on our way back to obtain a great deal of useful information in regard to the country and its resources.

On arriving at the Rio Gil Gonzales, we found that Lieutenant Leutze's party had demonstrated the impracticability of the line following the valley of that river, and on our entering their camp we met Messrs. Leutze and Crowell returning from the last of several reconnaissances which had been made by themselves and Mr. Miller, to find a practicable pass across the divide.

The Gil Gonzales, before reaching the lake, loses itself in a swamp, which, though it gave encouragement in one sense, promising comparatively low ground, made it extremely laborious to get the levels and traverse to the lake. After this was accomplished, however, the work became comparatively easy, though the elevation rose quite rapidly, and soon proved that no practicable line was to be found, though, of course, it was not abandoned until each of its tributaries had been followed up to an inadmissible altitude. There being no other locality

not already known, which gave any promise, the party was ordered in to headquarters, while we proceeded to visit Lieutenant Rhoades. We found that his line had reached within four miles of Brito, and had developed as well as had been hoped for it. The officers and men, like those of party No. 1, were all well, though nearly everybody in each party was suffering with innumerable itching sores, upon all parts of the person, produced partly by dietetic, and possibly by climatic causes, but mainly by the bites and stings of insects and the poisonings of different vines and plants; principally among the former were the *garapatas*, a vicious species of wood-tick, which swarm almost every leaf and plant growing near the ground, and are of every size from that of a pin-point to that of a large split pea; transferring themselves by thousands to one's clothing and thence to the person, they bury their heads under the skin and are extremely hard to rid of. Frequently beating the clothing with a switch will rid one of a great many of the little pests, but it was seldom that any one passed a whole day without finding a greater or less number upon his person. Although the region in which the parties were operating contained several estates more or less cultivated, yet by far the greater part of each line was through an unbroken virgin forest, the rank tropical vegetation in many places forming a perfect jungle; occasionally were met large areas filled with the terrible pica-pica, as it is called by the natives; it is a tall bush loaded with a kind of bean, whose pods are covered with a down consisting of minute barbed needles; these are detached from the bush at the least shake given to it, and alighting upon the person produce perfect torture, seeming to penetrate through the clothing as easily as into the unprotected parts of the skin; the sensation produced is exactly like that of fire. It was sometimes found impossible to cut through the pica-pica at all, and slight deflections of the line were caused by it several times. It is only at certain seasons that the pica-pica is so troublesome, and our parties unfortunately experienced it at its worst.

On the 15th of February Mr. Rhoades's party reached Brito, and Mr. Greene and Lieutenant Moser connected their traverse and levels, respectively, with Mr. Niles's tide-guage.

A few days were then spent in making detailed surveys of some particular localities. The traverse as already examined having been plotted, and the proposed line of the canal laid down on the map, it was found that it would be necessary, if possible, to turn in four or five places the channel of the Rio Grande, and also that particular information was needed at two or three other points, for which purpose the special surveys were directed. At the same time Mr. Hawley, with a few men, was sent with the boring apparatus to test the character of the excavations likely to be met.

A party consisting of Lieutenants Leutze and Miller, Mr. Crowell, Mr. McCrea, and three men, was also sent to run the levels between Lakes Nicaragua and Managua, in order to ascertain the exact difference of level.

By February 22 all the parties had returned, having completed their work, and preparations were made to transfer the expedition to the valley of the San Juan. For reasons which will be given under the appropriate head, the route just surveyed and known as the Rio del Medio line was regarded as showing a better combination of favorable conditions than any other line, and to be entirely practicable, not only in an engineering but also in a commercial sense.

On applying to the Messrs. Chomorro for the amount of the indebtedness of the expedition for the hire of men, animals, &c., I was informed

by them that they had been directed by the government of Nicaragua to pay on its account all expenses for such objects incurred by the expedition; this very handsome offer I did not feel at liberty either to accept or decline, without communicating it to your Department. In answer to my communication, I was directed to decline the offer with the Department's thanks, not only for that, but for all the assistance which had been given us by the government and authorities of Nicaragua. This order I communicated to the minister of foreign relations, who caused it to be published in the official gazette.

Our friend Mr. Hollenbeck having been notified that we were ready, sent the lake steamer to Virgin Bay for us; we embarked in her and proceeded to the mouth of the Zavalo, a tributary of the San Juan, which it joins just above Toro Rapids. Arriving March 4, 1873, we named our encampment "Camp Grant."

Although the river San Juan had several times been surveyed with more or less care, the surveys had always been confined to the river proper, and previous to our visit nothing was known of the adjacent country beyond what could be seen from the river banks. When it is considered that there is seldom a spot where the eye can penetrate two rods' distance, it will be seen how extremely limited the information was.

The Department's instructions required that the river should be examined with a view to such improvement, wherever possible, as should fit it for ship navigation, and that a location should be sought in its valley for an independent canal between those points where it should be found that the river could not be used.

GENERAL DESCRIPTION OF THE SAN JUAN RIVER.

Descending the San Juan we find it a broad open river for twenty-eight miles, when we reach the first, called the Toro Rapids; these are some two miles long; next we have a stretch of clear river for seven miles, then the second or Castillio Rapids, less than a quarter of a mile in extent, and taking their name from the fort upon an adjacent hill; seven miles farther we reach the Mico and Balas, coming so close together as really to form continuous rapids; their extent is not quite one mile; four miles farther down we come to the Machuca Rapids, the last which we find; their length is about two miles.

For twenty miles from the foot of Machuca the river has a depth varying from 20 to 60 feet, with but little current; this section is called by the natives Agua Muerte, or dead water. At the foot of the Agua Muerte, the San Carlos is received into the river, and is the first considerable tributary met; above this, although every valley has its little stream, often deep enough to give a good wetting to our parties, yet the most of these are insignificant. The Zavalo and the Paco Sol are the largest of the upper tributaries, but have but little effect upon the main river. Opposite and below the mouth of the San Carlos, which comes from a long distance up in the Costa Rica hills, the San Juan changes its character altogether, and is filled with shoals and sand-bars. Twenty-four and a half miles below the San Carlos is the confluence of the Serepiqui, a river of similar character and size, and also coming from Costa Rica. Thirteen miles farther, we come to the forks of the Colorado; here the main river divides into two branches, the principal of which, the Colorado, flows to the eastward and empties into the sea; the less, called the Lower San Juan, passes more to the northward, and is divided up into numerous mouths, one of which, the Tanso, dis-

charges its waters into the sea, the others into the lagoon which was once the harbor of Greytown.

About four miles above the forks, a small caño, called the San Juanillo, leaves the main river and flows in a direction generally parallel to the lower San Juan, which it finally rejoins near Greytown.

Most persons who are acquainted with the tropical regions agree in the opinion that, as a rule, slack-water navigation in tropical streams is almost if not quite impossible, on account of their being subject to sudden and violent freshets. The San Juan having its origin in a body of water of so large area as Lake Nicaragua, and being fed, as said above, by insignificant tributaries in its upper portions, is not there subject to these freshets. Below the confluence of the San Carlos, which drains a large extent of mountainous country, the San Juan partakes of the character of other rivers in the same region ; farther on it will be seen that we propose the use of the river only above the mouth of the San Carlos, and an independent canal from there to the sea. At the present time the freshets of the San Carlos, by backing up the waters of the San Juan, affect the rises in the latter even as high as the foot of Machuca Rapids. This backing up will, however, be entirely overcome by the dam, which is estimated for, to be located just above the mouth of the San Carlos.

A rapid examination of the river, made while on our way to Virgin Bay, had convinced us that the navigation from its head to Castillio Rapids could be so improved as to fulfill the conditions required ; it was therefore determined to begin at the latter place the survey for an independent canal-route.

The organization of parties Nos. 1 and 2 continued pretty much as before, except that Master Hawley took the level in Lieutenant Leutze's party, relieving Lieutenant Miller, who was placed in charge of a separate party to make a survey of the river proper. Master Miles, Ensign Bull, and Mr. Brown, a young English gentleman, who accepted the vacant position of first-class apothecary, were assigned to Mr. Miller's party as assistants.

Colonel Sonnenstern was the bearer of instructions from the government to Colonel Sandoval, commandant of the fort of Castillio, to let us have as many soldiers as could be spared from duty to act as machetoros. Colonel Sandoval was able to let us have but eight men, just half as many as we needed, and after trying in vain for nearly a month to get more, either on the river or from Greytown, Colonel Sonnenstern went to Granada, where he procured a full supply. In the mean time the parties had to work short-handed, adding no little to the severity of the labor.

The section of the country adjacent to the river, between the Castillio and the Machuca Rapids, is exceedingly broken, many of the mountain spurs extending to the very water's edge. This section of the work bid fair to prevent more difficulties in locating a canal, and consequently required a more careful examination than any other. I concluded to keep the two parties together until past Machuca, giving to Mr. Rhodes's party the main line, and to Mr. Leutze's the special surveys of the several rapids, and of the probable locations of dams ; and also the running of offsets from the main line to the river bank.

It will be seen further on how admirably, upon the result of the survey of this section, the engineering skill of Mr. Menocal has solved that part of the problem which gave us most discouragement while the survey was progressing.

The country was so much more broken than had been supposed that

a canal built through it would be enormously expensive, while it seemed as if the improvement of the river would be still more so. A happy combination of the two methods, however, has overcome the difficulties, and the section, instead of being the most expensive and troublesome, bids fair to be the least so.

A bench-mark was established on the left bank of the river about one-half mile above Castillio Rapids, and the work was fairly begun on the 6th of March. The parties made their first encampment in some farm buildings, but ever after had to rely upon their shelter-tents. These were of very light canvas, water-proofed, and afforded very fair protection from rain. Officers and men soon became so skillful in building houses with these that they were able to make themselves comparatively comfortable.

The line led through an unbroken virgin forest, so interlaced with parasites and undergrowth as to be almost impenetrable, and in most places altogether so without the vigorous use of the macheta, making it necessary to cut a trail for every foot of advance, passing sometimes three or four times a day over hills of greater or less height and through streams in every valley. Although at this season of the year we had reason to expect the dryest weather, scarcely a day passed without one or more showers, which converted the overlying stratum of clay into a stiff, clingy mud, particularly upon the hill-sides, where it was less covered with vegetable deposit. The labor upon the west side of the lake had seemed to be, and was, very severe, but it was looked back upon as very light in comparison to what was now endured, more particularly as the parties, always organized with the minimum number consistent with efficiency, were now, as has been mentioned, short, one five men and the other three. I might mention that no servants were allowed to officers, from commander down, as the small appropriation made it necessary to economize in every way possible. Indeed, after leaving the vicinity of Castillio Viego, the officers were obliged even to wash their own clothing, being out of the reach of anybody who could be hired for the purpose.

It would be impossible for me to express my appreciation of the untiring energy and zeal displayed by both officers and men, and of the cheerfulness with which they submitted to the hardships and discomforts of the seventy-six days spent in running the line to Greytown.

A general compass-course was taken from the map, and followed as nearly as the conformation of the ground would permit; constant reconnaissances on either side being made to take advantage of any low ground, which by diminishing the profile would compensate, or more than compensate, for the increase in length caused by deflections. This required a great deal of judgment, and was usually done by Mr. Menocal when present, and at other times by the officer in charge of the party, though there was ample employment for the latter without this extra duty; in fact it would always be better to have at least four officers in each party, so that when the officer in charge was absent upon a reconnaissance there would be another to lead the line without calling the officer in charge of either the transit or of the level to divide his attention between that duty and his own.

Mr. Menocal remained with party No. 2 until the line reached Machuca, and was indefatigable in his labors, saving many a mile of useless work by examining the country ahead of the instruments, though with every precaution the line would occasionally get into a nest of hills and spurs impossible to pass, when it would become necessary to retrace a greater or less distance and take a new departure, a most disheartening opera-

tion to a party with a long distance ahead and a limited time to accomplish it in.

With every exertion, under the existing circumstances, a mile a day was good progress, while in some few cases of unusually rainy days not more than 2,000 feet were made.

The line was so near the river that it was always convenient to locate the camps on its banks. This was a fortunate circumstance, as the only means of transportation was by boats or upon men's shoulders. A flat-boat, lent to us by Mr. Hollenbeck, and a large canoe, were used for shifting camps, which was done whenever the line extended so far that it was inconvenient to walk back at night. At first a new camp was made for about every four miles of survey, but later not more than one for each eight miles, the new camp always being carried some distance ahead of the end of the line.

The Messrs. Hollenbeck, Runnels, and Chomorro, and Colonel Sonnenstern under his familiar title of "Don Max," were all remembered in giving names to the encampments.

After a few days at the level, Mr. Hawley was taken with a severe attack of fever and obliged to give up; he was, however, sent to Greytown to relieve Mr. Reilly in charge of the bulk of our provisions which had been left there in store. Requisition was made upon Commander Reed of the Kansas for another officer and also for five seamen; in the mean time Lieutenant Leutze took charge of the level in addition to all his other duties. About the same time Lieutenant Commander Schulze was prostrated by a sunstroke, and so severe was the shock upon his system that the surgeon advised his being sent north as the only chance of recovery. Messrs. Schulze and Hawley had been a great deal in the West Indies of late, both serving in the first two expeditions under Commander Selfridge in Darien; neither was in a fit state of health to go on the present expedition, and we were deprived of the services of two experienced and zealous officers at at the very time when they were most needed. Mr. Hawley was very useful in his new position, however, which compensated largely for his loss in the field.

While the topographic parties were progressing toward Machuca, Lieutenant Miller made his preparations for beginning the survey of the river proper, fitting out for the purpose a little flotilla consisting of a flat-boat borrowed of a Colonel Hanger at the mouth of the Zavalo, a dinghy belonging to the Kansas, a balsa designed by Commodore Ammen, United States Navy, and a canoe; the flat-boat was designed to carry provisions and equipments, and also to be used as quarters for the officers and part of the men, and was fitted up with awnings and bunks; the rest of the men lived in the other boats.

The survey of the river was directed to be done with the gradienter, an instrument combining the functions of the transit and level, and also fitted with a micrometer-attachment, by which distances are obtained by measuring the angle subtended by a rod upon which two triangles are fixed 12 feet apart. The level was to be run from the lake to Castillo, where it was to be connected with Mr. Moser's initial bench-mark, in order that we might have a connected line of levels from the lake to the sea. On the 29th of March an officer came up the river from the Kansas with five seamen, two of whom were sent to Mr. Leutze, and the other three to Mr. Miller, making his party complete. About the same time Colonel Sonnenstern arrived from Granada with a number of natives, who were distributed between the two topographic parties, making them also of full strength.

In the hydrographic party the following distribution of work was made: Lieutenant Miller, with the balsa, took charge of the gradienter, recording the courses and distances and sketching in the topography. Master Niles, with the dinghy, took and recorded the soundings. Ensign Bull, with the canoe, took charge of the level and gradienter rods, and recorded the levels.

The work was done as follows: A bench-mark was established at the water's level on the wharf of the Navigation Company, at San Carlos; the rods were sent to the bench-mark, the gradienter set up, and back observations taken for course, distance, and height of instrument. The rods were then sent to the opposite bank of the river and somewhat down stream, where four observations were taken for course, distance, and height of station. Next, the instrument was carried down a convenient distance, but on the same side of the river, and back-sights were again taken as before. A line of soundings was run from instrument-station to rod-station, and thence to the next instrument-station, and so on. Mr. Browne, with the flat-boat, dropped down each day to a point abreast the last station, where a convenient place on shore was sought for building a fire, and the cook set to work to prepare dinner. By the time that was accomplished, which was generally about sunset, the boats were anchored in the middle of the river, to avoid as much as possible the mosquitoes, which came out in swarms as night approached. Dinner dispatched, all hands were generally ready to spread their mosquito-nets and go to bed. Before daylight in the morning everybody was astir, breakfast and the midday luncheon were cooked at the same spot which had served the night before, and the traverse was again started.

From San Carlos to the mouth of the Zavalo, the banks of the river are low and swampy, though the water was at about its lowest stage —earlier in, the work could scarcely have been done at all—heavily fringed with grass, and overgrown with trees, brush, and parasites. The last are always particularly luxuriant near the water, and assume the most fantastic and often beautiful shapes, forming screens and bowers of dense foliage of all colors and varieties, very charming to the eye, though anything but agreeable to those who have to cut through it to find a setting for an instrument or rod and an outlook to the opposite bank, and who often find themselves covered with ants and other insects by the time they have finished.

The topographic parties reached Machuca April 2. It was now determined to divide the remainder of the work into two sections, giving to Lieutenant Leutze's party the line from the mouth of the river Serepiqui to Greytown, and to Lieutenant Rhoades's that from Machuca to the initial point of Mr. Leutze's section.

Mr. Leutze and party, accompanied by Mr. Menocal, started in the flat-boat on the 3d and arrived on the following day at the Serepiqui, established their camp some two miles below its mouth, and commenced their line at once.

On the 9th of April Master J. B. Briggs, of the Kansas, joined Mr. Leutze, and was placed in charge of the level.

My first intention had been to run the line for a canal continuously from Castillo to Greytown, leaving it to be decided afterward how much of it should be used, and how much of the river itself, a little further examination convincing us that with slight improvement the Agua Muerte could be made fit for ship-navigation; and the time being very limited I determined to let Mr. Rhoades bench off where he now was, April 16, about four miles below Machuca, and to recommence

opposite the mouth of the San Carlos, directing Mr. Miller on his arrival to take up the level and connect Mr. Moser's two bench-marks.

By April 19 Mr. Rhoades and party had established a camp and commenced their new line.

At a good stage of water the river-steamers run from Greytown to the foot of Castillo Rapids, around which the cargoes are shifted by a tramway to another boat which carries them above the Toro Rapids, where they are again shifted to the lake-steamer. As the dry season advances the river-boats are first prevented from going nearer to Greytown than the forks of the Colorado, and soon after are unable to go above Machuca Rapids. A small flat-bottomed steamer of about fifteen tons burden is then brought into requisition to navigate the rapids, and even she has great difficulty in doing so. This state of affairs occurs at the very time when the freights on the lake and river are heaviest; when the coffee and indigo crops are being moved, together with large quantities of India rubber and hides. No little nerve is required in navigating the rapids at this season of the year, as the tortuous channels make it very dangerous to property if not to life. The river is strewed with the wrecks of steamers that have been lost in the last twenty years. Without the constant personal exertion of Mr. Hollenbeck, the steam-navigation company would have been brought to a stand-still this year; and as it was, on account of the necessarily irregular trips of the boats, it became sometimes a difficult matter to keep our parties supplied with provisions, though Mr. Hollenbeck did everything in his power to aid us. I was obliged, on one occasion, to carry a load to Mr. Rhoades by canoe, a distance of sixty miles, against the strong current of the river, arriving just in time to save the party from being out of almost everything.

Lieutenant Miller's party reached the head of Toro Rapids with their survey by April 26, after which, the river-banks becoming higher and firmer, they commenced to have somewhat easier work per mile, but compensated for it by making more miles a day.

We were now beginning to experience the weather that we had expected earlier in the season, showers becoming more rare day by day, contrary to the predictions of the inhabitants, who had expected an early return of the wet season. All the parties were in consequence making exceptionally good progress, and were straining every nerve to complete the work before it should be interrupted by the rains.

Mr. Rhoades's section between the San Carlos and Serepiqui was developing very favorably for the canal, but was passing through a great deal of swamp, which made the work very severe; indeed, had it not been for the very dry weather it would have been impossible, in many places, for Messrs. Green and Moser to set up their instruments at all. The party were availing themselves of the sand-banks left dry by the falling waters as locations for camps. These were very pleasant, being clear and free from vegetation, while the breeze had free access, making them much cooler than while surrounded by trees; but to pay for these every officer and man suffered more or less from the inigua, or jigger, as it is sometimes called, and the mosquito-worm. These, or rather their germs, are both deposited under the skin by insects, the former generally located in the feet, where the young are developed in large numbers inclosed in a sack. If these are not extracted or destroyed they produce ugly sores. The most of us before leaving the country became quite skillful in removing them, and following the native rule of putting a little of the ash or juice of tobacco in the cavity which had been occupied by the sack, none of our number suffered any ill consequences from

them. The mosquito-worm is much more troublesome. It attacks all parts of the person. The worm grows rapidly, and its gnawing is quite painful. The method used by the natives to extract it is to lay over the skin, for a few minutes, a piece of tobacco saturated in oil, after which it can generally be squeezed out without trouble. Calomel instead of tobacco is more efficacious still, and will sometimes succeed when the other fails. Mr. Greene removed two by it from his head where they had been annoying him for several days. The theory is, that the tobacco or the calomel makes the worm come to the surface.

I was never able to discover exactly what insect it was that produced either of these. The jigger is supposed to be deposited by a small sand-fly, and the worm, as its name indicates, by a peculiar kind of mosquito.

Insects, lizards, &c., had been so common from the first that the most of them had ceased to be annoying. Mosquitoes at night, and in the swamps at all times; and by day wasps, hornets, and congo-flies, particularly a large yellow species, which drew the blood every time it alighted upon the skin; no one could become enough used to it to produce indifference; our parties had plenty of opportunity if it had been possible. Garapatas, though not uncommon, were so much less plentiful than they had been on the west side as not to be taken into account. On the other hand mosquitoes which, except in the swamps, had never troubled us there, were here in countless swarms. Another of the pests of nearly every camp was the alligator-ant, which attains a length of nearly an inch, and whose bite is as painful as the sting of the hornet, and apparently even more poisonous. Hartshorn was always carried by some member of the parties as a remedy for bites and stings. Among the many favors which had been bestowed upon us by Mr. Runnels and his family, of Virgin Bay, was a present to each officer of a cedron-bean, said to be a certain remedy for the bites of venomous snakes or the sting of tarantulas; fortunately we never had occasion to test its merits, though there were many narrow escapes. Parasite vines of all sizes and colors, and festooned in every imaginable form, were so common that a snake hanging from a limb of a tree would often be unnoticed by the officers and sailors, though never by the macheteros, who seemed to be on the constant lookout for them. Occasionally one of the former would suddenly feel himself seized and jerked back, and would find that the keen eye and the strong arm of one of the natives had rescued him from an enemy that he himself had not seen, though perhaps looking directly toward it and not a yard from it.

Toward the last of April, Mr. Lentze's line had reached the San Juanillo, and was extending down its valley toward Greytown; the ground was very swampy, with heavy cutting, while the river itself at its head was impassable even for the smallest canoe, being full of drift-wood, and at that season having scarcely any water. After extending the line some three miles from the main river, returning each night to the camp which was still on the banks of the latter, it became impossible to proceed farther without obtaining a nearer camping-ground, as the six miles' walk going and coming was a fair day's work of itself. As it was quite impossible to transport the camp equipage, provisions, &c., to the end of the line, even if there had been a suitable location for a camp, it was concluded to cut a trail through, striking the main river some distance lower down, (the two streams, near their forks, running at an acute angle with each other.) This picket proved to be over a mile long, passing over several steep-sided hills, fortunately none of them very high, and through swampy ground in their valleys. It was

some improvement in point of distance, however, and the camp was shifted down to where the picket struck the river-bank. The line was now extended some three miles farther on a compass-course, leading over hills, across runs, through swamps and mire, across several sloughs, and across three lagoons. Some of the streams could be forded, others had to be bridged by felling trees across them; logs had to be dragged and laid to make a footway across the sloughs, and generally the best that could be done made but a precarious one. Each time the party passed over the line it would be found that much of the work had to be done over again. The lagoons were overgrown with a tall, thick water-grass; this was beaten down until a sort of floating island was made, when by stepping lightly and quickly over it, the party succeeded in getting across, not without an occasional mishap attended with a good wetting and no little danger, as it was impossible to swim, and next to impossible for one to aid another.

It was hoped every hour as the line advanced that the San Juanillo would again be intersected and found navigable, when it was proposed to move the camp to its banks, by taking the boats down the lower San Juan to the junction, and up the former stream to the camping-place. After going about three miles, a sluggish stream flowing to the southward and eastward was crossed. According to the best maps in our possession this should have been the desired river; it was still too shallow for the boats, and too muddy to be waded; so full of logs and other obstructions that even if the bottom had been hard it would have been a tremendous task to follow its bed. There was nothing left to do but to try and strike the stream again, lower down. Lieutenant Leutze and Mr. Crowell, with the macheteros, now spent one day cutting a trail to intersect the river. A mile and a half was run, showing no signs of it, and finally coming into a nest of hills; the party now returned to the main line, and extended that for 3,000 feet, when the lateness of the hour compelled them to start for camp. The work accomplished, together with the walk from the camp and back, had made a very severe day's labor, but there was worse to come. Mr. Leutze now resolved to cut through on the compass-course which he had been following, until the river was reached, and to run the instruments over it afterwards. Accordingly, on the morning of May 3, he, with Mr. Crowell and the macheteros, set out before daylight. The end of the line was nearly five miles from camp, and the trail, made worse each time it was passed over, was exceedingly heavy. On reaching it the men were divided into two reliefs, and working an hour each at a time. The line was advanced 13,600 feet, passing for a couple of miles over the same swamp and mire, after which it intersected seven different hills, from 80 to 150 feet high, with very steep sides; then a valley was followed for some distance, whose water-course had to be forded in numerous places; next, a wide shallow stream was reached. This obstacle at first seemed insurmountable; the stream was too shallow to be crossed by swimming; its muddy bottom afforded no footing, and its width precluded the usual method of bridging by felling a tree across it. Finally all hands set to work to cut and bring branches. These were thrown into the water, and confined in place by logs until sufficiently firm to bear a man's weight; then some of the number occupying that which was already laid, built further in the same manner, till a sort of causeway extended from bank to bank. The party then crossed over, but so little sustaining-power was there in the structure that the last man was nearly up to his waist in water before he reached the bank.

The party now proceeded on a short distance farther, when they sud-

denly came out upon the shore of a beautiful lagoon. The map showed a nest of lagoons in the vicinity, all connected with the San Juanillo, but whether this was one of them or not could not be told. Hoping that it might be, a signal was erected at the end of the picket and the party turned their steps homeward. Mr. Leutze hung up his blue flannel shirt upon the signal to make it more conspicuous. They reached the camp some time after dark, some of the number so exhausted that it was feared they would not be able to reach it at all. The day had been intensely hot, the breeze being entirely cut off by the dense vegetation. Myriads of insects filled the air; the yellow congo and the mosquitoes seemed unusually vicious. The fifteen miles of tramping, wading, climbing hills, scrambling over fallen trees and through the jungle would have been a severe day's work, alone, without the additional labor of cutting and road-building.

The limits of this report make it impossible to give anything like a detailed account of the labors of the different parties or of individual officers, but the above will give an idea of them, though candor compels me to say that the last day here described never had quite an equal; indeed, a very few such would have broken down the strongest of our people. Throughout the expedition the officers not only directed but led the work, no matter how hard or disagreeable it might be, and were most cheerfully followed by the petty officers and seamen. Especially deserving of mention were Messrs. John Quevedo, Charles H. Mays, Paul Hoffmann, John Buck, Joseph C. Bruner, and Henry Butz, who enlisted with petty officers' ratings to do duty in the expedition as rodmen, polemen, and chainmen, and exhibited great zeal and intelligence in the performance of their duties.

A couple of days after the events above narrated, Messrs. Leutze and Crowell went to Greytown, where they procured the services of an excellent guide, well acquainted with the Juanillo lagoons, and who, from their description, recognized the lagoon which they had found as the Silico, named from the Silico palm which grows upon its borders: to this he guided them. The route led up the San Juanillo for about four miles, then through a small creek and into the lakelet; here, to their joy, the signal was found. A great many fallen trees, branches, &c., had to be cut away before even a canoe could be forced through the creek. They now selected a place for a camp and returned to Greytown. A couple of days later they had brought the party around, established themselves in their new camp, and set to work to run the instruments and chain over the trail which had been cut, as described. First, however, several reconnaissances were made to see if the seven hills could be avoided without too great deflection. It was found that they could not be, and the line was accepted as it had been orignally run.

May 13, the commanding officer, accompanied by Colonel Sonnenstern, went in the Kansas to Monkey Point, examining carefully the intermediate coast for harbors, or locations where harbors might be formed, making surveys of the angles in the shore-line at Punta Gorda and at Monkey Point to see if either of these could be utilized; both, however, proved hopeless for the character of harbor required for a canal terminus. The country between Greytown and Monkey Point was very broken, except the alluvial formation which extends only a little over one-half of the distance. Colonel Sonnenstern, who, in 1866, had passed over the route between San Miguelito, on the lake, and the mouth of the Roma River, had declared the country to be utterly impracticable even for a railroad, which was then projected; but, although having every confidence in the opinion of that gentleman, the commanding

officer thought it better to make such a personal reconnaissance in that direction as would fulfill the instructions of the Navy Department.

By May 22 all the parties had arrived in Greytown—the work in the interior complete. The weather for the last month had been magnificent, and more had been accomplished than during the previous two months. On the 20th the weather changed entirely, bringing heavy and frequent showers.

Several of the officers and men who had held out to the last day of the work, now, that the strain was relieved, were attacked with fever. Mr. Rhoades was among the number. None of the cases were at all serious, and were mainly due, probably, to overwork, and to sharp wettings during the last two or three days on the line.

There now remained only some hydrographic work to be done to supplement a survey of the harbor made the previous year, and to get the steam-launch down from the lake, the low stage of the water in the river not having permitted it before. As it was hoped that there might have been a rise, or soon would be, a small party under Mr. Leutze, accompanied by Mr. Browne, was sent after the launch. The commanding officer, Colonel Sonnenstern, and Dr. Bransford went up the river at the same time to attend to other matters, part of which was to pay off at Castillo the soldiers who had served as macheteros, and also deliver and pay for the use of some canoes which had been employed by the expedition.

In getting the launch over Tero Rapids, she was unfortunately grounded in about the worst part of it, involving two days' labor for all hands in the water. We even had the doctor overboard up to his neck; although this was not exactly in his department, the doctor was always ready for hard work when it could be made useful. The cultivation which Mr. Leutze and Mr. Browne had each given to his muscle worked greatly to our advantage also. Our friend Mr. Hollenbeck finally came to our rescue, after we had, with only partial success, exhausted our own means. Coming by in the steamer Panaloya, he tied her up to the bank, took our line to his capstan, and, after two or three hours' work, succeeded in getting the boat off. He then piloted her safely over the rapids through a channel known to himself.

At Castillo Mr. Leutze rigged sheers and hoisted out the launch's boiler, Colonel Loudoval with his soldiers, manning the falls of the tackle. Everything else was removed from the boat that could be, but as she still drew some four feet, it was found impossible to get her over the rapids. No rise had as yet taken place, though considerable rain had fallen. Mr. Hollenbeck promised to send the boat down the river by some of his people, as soon as there was a sufficient rise. We therefore left her in charge of a watchman, and returned to Greytown. On our arrival I found awaiting us orders from the Department, directing me to send a number of the officers home by mail steamer, and the remainder of the expedition by the Kansas. The former arrived in New York July 3, and the Kansas with her party, July 20. I am happy to say that not an officer or man was lost from any cause.

A full and detailed report is in course of preparation, with maps, plans, profiles, and diagrams, designs for locks, dams, culverts, &c., and for breakwaters and other proposed harbor improvements, with the estimated cost of each, and will all be forwarded to the Department as soon as completed.

The work was constantly checked as much as possible. So long a traverse required extreme care to prevent its swinging out more or less. As has been said, this work was immediately intrusted to Messrs. Greene

and Crowell, in the topographic parties, and to Mr. Miller, in the hydrographic. Offsets were frequently run from the main line to the river-bank, and were connected by Mr. Miller with his traverse. These gentlemen also sketched in the topography.

The levels from the lake to the sea, an aggregate distance of one hundred and nineteen miles, were run by three different officers, viz, Lieutenant J. F. Moser and Master J. B. Briggs, on the main line, with intermediate sections by Lieutenant Miller, upon the river-banks. These, compared with the line on the Pacific side, showed the height of the lake to be absolutely the same above mean tide of either sea. When the character of the ground passed over is considered, this coincidence seems quite remarkable, and shows with what extreme care the work was executed.

Too much cannot be said in praise of Lieutenants Rhoades, Leutze, and Miller, the commanders of parties, for the intelligence, judgment, and zeal with which they performed their multifarious and often perplexing duties. Lieutenant Miller speaks in the highest terms of his assistants, Messrs. Niles, Bull, and Browne.

Mr. McCrea, commander's clerk, volunteered for the duty of rodman, and continued to perform it until taken down with fever.

Dr. Bransford, in addition to treating the sick in the most successful manner, was indefatigable in collecting specimens of plants, animals, insects, &c., and in acquiring a knowledge of the peculiar diseases of the country, and what differences of treatment were found necessary in the case of the natives and of foreigners, for this purpose treating gra tuitously all who applied to him. His report will doubtless be very in teresting to medical men.

Mr. A. G. Menocol, the chief civil engineer, by his thorough knowledge of his profession and his constant personal exertions, as much as possible accompanying that party, who, for the time being, were operating in the most difficult section of country, contributed enormously to the success of the expedition. Indeed, with so able and zealous a set of officers there was but little left for the commanding officer to do except to keep the parties in supplies, and failure was impossible. I beg to add that these remarks are not made, as so often is the case, for the sake of saying something agreeable, but as giving expression to a conviction which was of great comfort to me during the progress of the work. As I could not be with each of the parties all the time, it was very pleasant to know that the work went on quite as well when I was not present as when I was, and possibly better.

THE PROPOSED CANAL AND IMPROVEMENTS.

The surface of Lake Nicaragua is 107 feet above mean tide in either sea. It is proposed to make this the summit level of the canal, and to connect the lake with the Pacific by canal, and with the Caribbean Sea by a combination of canal and slack-water navigation.

WESTERN DIVISION.

The first section of the proposed canal toward the Pacific leaves the lake at the mouth of the Rio del Medio, and extends for a distance of 7.58 miles, with an average depth of cutting of 54 feet. This section is by far the most expensive part of the whole work. The second section extends from the end of the first to Brito, a distance of 8.75 miles, making the total distance from lake to sea 16.33 miles. The line has been laid down

as nearly as possible to correspond to the lowest profile. It consists, however, of straight reaches and of curves which are arcs of circles. The smallest radius admitted is 2,200 feet. The excavation in the second section will be, throughout, less than the prism of the canal; in other words, the proposed surface is higher than the profile of the ground. The material taken out will be used to build up embankments. There will be ten descending locks, all in this section, and located in the straight reaches. There will be at Brito a tide-lock.

LAKE NAVIGATION.

From the mouth of the Rio del Medio to the head of the San Juan the distance is about 56 statute miles. Twenty-six feet of water can be carried to within 1,350 feet of the mouth of the Rio del Medio. On the east side a channel will have to be deepened from 6 to 8 feet for a distance of nine miles. The bottom is a firm mud, easily removed by the dredge.

EASTERN DIVISION.

SLACK-WATER NAVIGATION.

It is believed, for reasons which have already been given, that slack-water navigation in the upper part of the San Juan is entirely practicable.

It is proposed to improve the river by the construction of four dams, the first at Castillo, the second at Balas, the third at Machuca, and the fourth near the mouth of the San Carlos. Most excellent locations for dams exist and have been selected at the first three places, with solid rock foundations, shallow water, and a wide channel-way in proportion to the general width of the river, thus subjecting the dams to the minimum risk from the force of the water. The location at San Carlos would be called good, except in comparison with the others, which are exceedingly favorable.

Some improvement in the bed of the river will have to be made here and there by dredging and blasting out rocks. This has been estimated for, the amount of excavation being computed.

To get around the dams there will be required sections of canal of the following lengths, respectively, each containing one lock, viz, at Castillo, 0.78 mile; at Balas, 1.57 miles; and at Machuca, 1.16 miles.

CANAL.

From the mouth of the San Carlos to Greytown, a canal of 41.9 miles in length is proposed. This line has been laid down to correspond with the lowest profile, except when the increase of length required to make it do so was too great to be compensated for by the diminution in the depth of excavation. The curves, as in the western division, are all arcs of circles. The least radius is 2,500. The profile is so favorable that 36.96 miles out of the 41.90 will require excavation less than the prism of the canal, the material being used for embankments. The remaining distance is made up of several short reaches where the line cuts through hills.

Seven locks in addition to those abreast the dams will be required, making ten in all. These will be located in the hills just mentioned, in order to take advantage of the rock foundation, the advantage of which will be enormous.

The total length of canal will thus be 61.74 miles; of this, 47.37 miles will be in excavation and embankment combined, leaving but 14.37 miles in which the excavation is greater than the prism of the canal. 6.50 miles of the deep cutting is in one section, *i. e.*, in the first of the western division; the rest is composed of the cuts through hills and parts of the sections around the dams. In all cases on the east side there will be convenient places of deposit for the material taken out close at hand; where embankments are made the whole of the material removed will be placed directly abreast the place from which it is taken.

The eminent American engineer, Mr. J. C. Trautwine, estimates that where excavation costs 19 cents per cubic yard when deposited within 25 feet, it will, if carried one mile in carts, cost 57.09 cents, and if carried two miles, will cost 95.57 cents per cubic yard. This exhibit of the rapid rate of increase in cost will show how immense is the advantage in a work of such magnitude of having the place of deposit so close at hand.

It happens that the section of the western division requiring the deep excavation is located in the best cultivated part of the country and where there are most roads. A little exercise of judgment on the part of the person directing the work will enable him to get rid of the most of his material even there without carrying it any great distance. The crest of the divide is but a few yards wide and the descent is quite rapid on either side. By commencing the work at different elevations turnouts will be found near at hand.

In comparing the relative merits of any two proposed routes for a canal, nothing can be less satisfactory than the mere statement of their relative lengths without also stating the average depth of excavation; thus, were the sides vertical, then would a canal ten miles long, with an average depth of 40 feet, be equal to one twenty miles long, with a depth of but 20 feet; but, in fact, the banks must always have an outward slope, in order to be self-sustaining; the least slope admissible in canals of the character here considered is in earth 1½ feet to 1, or, as both sides are the same, the cross-section widens 3 feet for every 1 foot of increased depth. The canal here estimated for has an average depth of cutting of but 9 feet above the prism, or the proposed water surface; the 61.74 miles are equal to but twenty-two miles of one whose average depth above the water-surface is 40 feet.

In estimating the cost of the work, 35 cents per cubic yard has been allowed for earth, and from $1.25 to $1.50 in rock. In computing the amount of rock, care has been taken to allow for more than is likely to be met, in order to be on the safe side.

It will be seen that prisms of two different widths are estimated for, the reduced is proposed for those portions which require deep cutting, and, except that the proposed depth of water is one foot greater, does not differ materially from the dimensions proposed for the Darien Canal. The wider is proposed for all the rest of the canal, *i. e.*, for those portions where excavation and embankment are to be used. The difference in the shape of the prism for earth and for rock is due to the different slopes required.

DIMENSIONS OF CANAL PRISM.

Reduced.

	In rock.	In earth.
Width at bottom	50 feet.	50 feet.
Width 10 feet above bottom	90 feet.	
Width at surface of water	106 feet.	128 feet.

	Broad. Earth.
Width at bottom	72 feet.
Width at surface of water	150 feet.
Width 10 feet above surface	180 feet.

The depth of water throughout is 26 feet.

The dimensions of the locks are: length between miter-sills, 400 feet; width of chamber, 72 feet.

It will be seen that the Rio del Medio route has been chosen in place of that known as Childs's. The reasons for this are as follows: First, the distance by the former is 2.60 miles less than by the latter; this advantage is about compensated for by a greater summit-height. Second, the valley of the Rio Las Lajas is exceedingly tortuous, giving curves of so small radius that it would be impossible to locate the canal in them, and to cut off the bends would carry the excavation through numerous hills which extend to the river-bank. The third and most potent reason is, that the Las Lajas line intersects no less than five considerable streams, which would have to be taken into the canal and would cause great inconvenience. On the other hand, the Rio del Medio line receives but one stream, and that under so favorable conditions that it can, without trouble and at moderate cost, be sent under the bed of the canal, by means of a culvert which will be found to be estimated for.

HARBOR AT BRITO.

On the right bank of the Rio Grande there is a high rocky hill which juts out into the sea in the form of a promontory for a distance of 1,600 feet. The sides are steep-to. There are, near the outer extremity, 18 feet of water at low tide, close alongside the rocks.

The left bank of the river terminates in a sandy beach, bearing to the south-southwest. An angle is thus formed in the coast which we propose to convert into a harbor by running a breakwater from the end of the point in a southwest direction for a distance of 1,600 feet. The outer end will be in 6 fathoms of water. The rock can be blasted right at hand and dumped into the sea, being allowed to take its own slope. The bottom is a firm sand, but no doubt overlies a bed of rock, judging from the formation of the coast. The deep water extends to within 200 feet of the beach, where some dredging will have to be done.

HARBOR AT GREYTOWN.

A commodious and excellent harbor once existed at Greytown. The strip of sand which formed its outer limits has now extended across what was the entrance, and has converted the harbor into a lagoon. This has been gradually silting up, until there are islands where twenty years ago there was water enough to float a frigate.

The silt which has been destroying the harbor is a volcanic sand, so light as to be held in almost complete suspension by rapidly flowing water; it is the material of which the whole delta of the San Juan has been mainly formed; and, indeed, the entire alluvial district in the vicinity.

A quantity of sand taken from the outer beach at Punta Arenas (as it is still called) was recently submitted, with some from the sea-beach at Monkey Point, thirty-two miles north of Greytown, to Professor Henry, of the Smithsonian Institute. Under his direction the two specimens were examined and compared by the mineralogist of the

institute. As will be seen, they were found to be quite different in composition and structure, showing clearly that the sand from Punta Arenas was not thrown up by the sea, but deposited by the river.

The constituents and peculiarities are as follows, viz:

No. 18.

Sand from Punta Arenas.

Constituents:
Quartz, a small quantity.
Tourmaline.
10 per cent. magnetic sand.
Feldspar, small percentage.
Hornblende, probably.
Color, dark grayish-brown.
Grains fine, but coarser than No. 19.
No fragments of shell in this specimen.

No. 19.

Sand from Monkey Point.

Constituents:
Quartz, chiefly.
Tourmaline.
3 per cent. magnetic sand.
Feldspar, small quantity.
Fragments of marine shells.
Color, light grayish-brown.
Grains very fine.
This sand has evidently been subject to the action of water longer than No. 18.

The question is, can the harbor of Greytown be restored?

The first idea which seems to present itself to every mind as a solution to this problem is, that if the water of the Colorado be turned into the Lower San Juan by a dam placed across the head of the former, this will scour out the harbor and keep open its entrance.

Before we had fully examined the subject, this idea was very generally shared by the officers of the expedition. Its utter impracticability soon demonstrated itself.

For several years the Lower San Juan has been filling up and the Colorado widening and deepening. Just below the forks, the former is now, at the lowest stage of the water, but 324 feet wide and 6 inches deep; the latter is 1,200 feet wide and 10 feet deep. Its banks and bottom are of the silt already described. It is doubtful whether it would be possible to dam the Colorado at all; but if it could be done, the water would be more apt to cut around or under the structure than to make for itself a channel through the Lower San Juan.

A committee of the National Academy of Sciences in 1867 proposed, as a partial remedy for the decay of the river and harbor, the dredging out of the channel of the Lower San Juan and the construction of a wier from Leaf's Island to Concepcion Island. The latter of these is in the main river, near its right bank and above the forks. The former has now become joined to the angle or point of the main land, between the two branches. Concepcion Island is 2,000 feet from the point. The strongest part of the current runs between the two. The island is constantly cutting away at one place and forming at another, being composed entirely of silt banked around drift-logs which have lodged in the shoal water.

The wier, if indeed it could be constructed at all, with such a combination of unfavorable conditions, viz, the depth and strength of the water, and the yielding character of the bottom, would be quite as likely to fail in, as to effect, the object in view, *i. e.*, the turning of the current into the lower San Juan, unless the latter was dredged out to a sufficient width and depth to prevent, by drawing it away, the water from cutting around the dam. This would have to be done for a distance of thirteen miles. I confess myself to have been very much discouraged when these facts and convictions impressed themselves upon my mind.

A thorough examination of the river made subsequently, showed us that all the silt comes from the San Carlos and from other Costa Rican Rivers, having their confluences lower down. This is the reason why the San Juan, below the mouth of the San Carlos, is filled with shoals

and sand-bars. Before this fact had been established, other considerations, already detailed, had forced us to the conclusion that this part of the river could not be used, and that a canal must be built instead.

It is quite clear that, so long as the silt-bearing water is permitted to flow into the harbor, although, by adding to the current, it may assist in scouring at the entrance, it will certainly deposit in the still places, and indeed all over the broader parts of the harbor. Our plan is therefore to cut off the lower San Juan, and send all the water of the San Juan and its lower tributaries through the Colorado mouth, admitting to the harbor only the waters which come through the canal and through the San Juanillo, which will be perfectly clean. The harbor will then have to be dredged out to the proper size and depth. After which there will be nothing to again destroy it. A breakwater or jettee is estimated for to protect the entrance from the surf. The narrow strip of bare sand which divides the bay, if bay it may be called, from the sea, now shifts with every strong breeze that blows, and should be made permanent by covering it with mangrove and tough water-grasses. This might require several years for its accomplishment, but could be done with proper care. The planting should be done at the beginning of the rainy season, and those portions that did not take hold should be supplemented the next year, and so on till the work was complete.

ESTIMATES.

The following are the estimates of the cost of various parts of the work, and are believed to be ample in each case, viz:

Clearing and grubbing	$310,000
13,270,271 cubic yards of excavation in rock, at from $1.25 to $1.50 per cubic yard	18,217,300
28,237,401 cubic yards of excavation in earth, at 35 cents per cubic yard	1,131,025
3,231,500 cubic yards dredging, east side, at 35 cents per cubic yard	19,441,289
941,541 cubic yards of embankment, at 15 cents per cubic yard	1,191,231
Dredging channel in lake to deep water, east side	1,705,379
Dredging channel in lake to deep water, west side	464,100
Dam at Castillo	290,000
Dam at Balas	430,900
Dam at Machuca	318,142
Dam at San Carlos	550,000
Dredging, &c., in river, viz, 3,530,687 cubic yards earth, at 50 cents, and 942,410 cubic yards rock, at $3	4,092,573
20 locks	8,000,000
1 tide-lock at Brito	421,306
Breakwater at Brito	213,330
Breakwater at Greytown	700,000
Dredging at Greytown, cubic yards	1,700,000
Dredging, &c., at Brito	700,000
Diversion of Rio San Carlos	400,381
Diversion of Rio Grande in five places	175,025
Crossing the Rio Zola	87,725
Culverts, west side	70,230
Culverts, east side	380,000
Side-drains, west side	42,240
Side-drains, east side	110,000
Total	.....
Add 25 per cent. for contingencies	.....
Grand total	.....

WATER-SUPPLY.

Lake Nicaragua has a surface area of 2,700 square miles, and drains a territory of not less than 8,000 square miles. It would therefore seem unnecessary to consider the question of water-supply, except to show that it has not been forgotten.

Careful gauges of the San Juan River at numerous points were taken by Lieutenant Miller and party, using a delicate current-meter for the purpose. The least water found, and at about the lowest stage, was 11,390 cubic feet per second, or 984,096,000 cubic feet per day; against this supply we have the following as the maximum demand: Allowing forty lockages a day, or counting the ascending and descending, say eighty per day, without deducting the displacement of the vessels, which in descending we have the right to do, we have—

	Cubic feet.
80 lockages per day	2,240,000
Allowing 1,000 per cent. for leakage, filtration, waste, and evaporation	22,400,000
Total demand	24,640,000
Total supply	984,096,000
Excess of supply over demand	954,456,000

Or, to put it in another form, there is a supply equal to thirty-eight times the maximum possible demand.

CLIMATE, HEALTH, ETC.

The year in Nicaragua, as in the rest of the Isthmus, is divided into two seasons, the wet and the dry; the latter begins about the end of November, and lasts until May or June, when the rains begin, and continue with more or less force during the remaining months of the year.

Unlike the more southerly portions of the Isthmus, the rains here begin earlier and last longer near the Atlantic coast than in the interior. The annual rain-fall differs in different parts of the country, and in the same part differs for different years. No regular system of meteorological observations, continuing from year to year, has ever been established, as far as I have been able to ascertain. The present expedition found at Virgin Bay an aggregate fall of 47.79 inches from July 1, 1872, to March 1, 1873. As this period included the whole of the wet season the result probably does not differ very widely from the average annual rain-fall in that section. In the valley of the San Juan it is probably twice as great. This will, of course, be greatly modified in the event of extensive clearing at any future time.

Nicaragua lies wholly within the trade-wind belt, and during the dry season, when the trades "blow home," the climate is certainly delightful. In the vicinity of Rivas the thermometer seldom stands higher than 82° Fahrenheit in the shade, at mid-day; at night it often falls to 68°. In the valley of the San Juan it is somewhat warmer, but even there one can rarely sleep comfortably at night without a woolen blanket.

There is a very general impression abroad that the whole American Isthmus is exceedingly unhealthy, and this, as I conceive, very incorrect idea is entertained by many intelligent persons who have spent longer or shorter periods upon the Isthmus. It is true that in former years a large percentage of foreigners who remained there for any length of time died or were broken down in health, but nine out of ten of these cases were due to dissipation, or to the neglect of the simplest sanitary precautions, or generally to both. Dissipation will certainly kill much more surely and quickly in the tropics than in a temperate climate, and to just that extent and no more was the climate responsible for these cases. There have been during the last four years three exploring expeditions in Darien and two in Nicaragua. There have been as high as three hundred men employed at once, counting ships' companies, subjected to severe labor and exposure. Not a single officer or man has been lost from climatic disease. Under Providence, I ascribe this entire im-

munity to death and serious disease partly to the following of a few sanitary rules, which anybody may do without inconvenience, but mainly to the strictly temperate lives led by officers and men (some voluntarily and some per force) while operating upon the Isthmus.

The percentage of deaths due to climatic causes alone, I am fully convinced, is smaller than in any other part of the world.

The prevailing diseases are few in number, simple in character, and generally yield most readily to treatment, unless the patient's blood is vitiated by alcohol.

Cleanliness, temperance in eating and drinking, sleeping under shelter and in dry clothing, wearing flannel next the skin at all times, avoiding heavy night-dews, and avoiding bathing immediately after meals or while much heated, are all the precautions necessary to preserve health; and with these any foreigner will be as safe upon the isthmus as anywhere else.

INHABITANTS, PRODUCTS, ETC.

The population of Nicaragua is variously estimated at from 250,000 to 300,000, and consists of whites, Indians, and negroes, and of mixed bloods in all degrees. Many of the Indians are civilized, and among their number are some of the worthiest citizens of the State. There are several tribes, however, in as savage a state as when the country was first discovered. These occupy the northeastern part of the territory.

The state is politically divided into departments. Of these the departments of Rivas, Granada, and Leon, bordering upon the Pacific, contain the bulk of the population and wealth.

The most numerous class of the inhabitants is formed by the Ladinos,* a mixture of white and Indian. Next to these, probably, are the pure Indians. The least numerous of all are the whites.

The laboring classes, both among the civilized Indians and the mixed races, are honest, docile, hardy, and not averse to hard work when occasion requires it, but so few are their natural wants (they have no artificial ones) and so easily supplied that they generally have no need of it. I estimate that, in the event of the construction of a canal, Nicaragua and the neighboring States would supply from 3,000 to 5,000 laborers; but this is very difficult to get at with any degree of accuracy, particularly in view of the probability that many new industries would be developed, each with its demand for operatives. Agriculture and grazing especially would receive an immense impetus.

The average wages of farm-hands and other out-door laborers, at the present time, is $16 per month, and the cost of subsistence at the present rates is $6 per month.

Nicaragua is full of undeveloped sources of wealth, some of these have been experimented with in a limited degree, but nothing to a beginning of its full capacity. Indigo, coffee, and cacao, all of excellent quality, are cultivated and exported to some extent. Sugar is raised, but the machinery used in its manufacture is of the rudest character and the article produced of very poor quality, though the cane is rich enough to rival the best in the world. Corn, beans, rice, yams, cassava root, quiquisque, a superior kind of yam, tobacco, plantains, bananas, oranges, limes, pine-apples, mangoes, watermelons, cantelopes, tomatoes, cocoanuts, nisperas, peppers, and numerous other fruits and vegetables grow in all parts of the country, and almost spontaneously. Near Greytown the delicions bread-fruit is raised, though hitherto no one has succeeded in producing it in the interior.

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* This word is used with a different signification in some parts of Spanish America.

Of the domestic food-animals are beeves, hogs, goats, sheep, turkeys, ducks, common fowls, &c.

The forests are filled with game, among which are deer, wild hogs, tapirs, armadilloes, rabbits, turkeys, pheasants, ducks, mountain hens, pigeons, and many others. The manitee is found in the rivers and lagoons, and is highly esteemed as an article of food. The rivers and adjacent seas abound in fish of many varieties. Turtle are taken on the coasts. The country can abundantly supply all the subsistence which would be required in the event of a canal being constructed. Many articles yield two crops a year, others yield perpetually. Even the rude cultivation now given to the ground produces abundant returns. With the introduction of improved machinery and implements, and proper system, the yield might be augmented indefinitely; and it seems altogether probable that, with the increased facilities of transportation that must follow a large influx of people, added to the improvements above spoken of, prices will remain where they now are, even with the largely increased demand.

Abundance of valuable timber for construction, cabinet-work, dye-woods, &c., are found in all parts of the country, among others are mahogany, rose-wood, lignum-vitæ, cedar, moran-nispera, roble, ceiba, madera-negra, ron-ron, laurel, melon-tree, madroño, fustick, Brazil-wood, granadillo, cortes or iron-wood, guapinel, pochote, guanacoste, espanel, and others. The espanel is said to be impervious to the teredo navalis. The India rubber tree is found in many parts of the country, and furnishes a rapidly growing article of export.

Cochineal has been cultivated to some extent.

Medicinal plants and trees abound, though very little use is made of them so far.

There are many plants whose fibres are valuable; among these are cotton, pita, pinñela, tule, palm, and cocoa-nuts. Hats, cordage, hammocks, and some other articles are made with rude appliances.

Rock, limes, and clays needed for construction are to be had in great abundance. It is proposed to use concrete in place of dimension stone in the construction of locks, dams, &c. Material for this can be had immediately at hand in every case.

Gold and silver are found in paying quantities. The richest mines now being operated are in the department of Chontales on the east side of the lake. This region has been so little explored as to make it altogether improbable that a tithe of its mineral wealth has been discovered.

An inter-oceanic ship-canal across the American isthmus has been so long a subject of discussion among statesmen, merchants, and navigators, its desirability so often proved by able pens, the enormous saving of distance, cost, and risk which it would give to the commerce of the world so carefully tabulated, that there seems to be nothing left to prove except its feasibility; this I believe we shall be able to do from the information now in our possession, and that the line which has just been examined through Nicaragua presents by far a better combination of favorable conditions than any other route which has as yet been examined.

I have the honor to be, sir, very respectfully, your obedient sevvant,

EDWARD P. LULL,
Commander United States Navy,
Commanding Nicaragua Surveying Expedition.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

No. 14.

POLARIS EXPEDITION.

[Telegram No. 1.]

SAINT JOHN'S, NEWFOUNDLAND, *May* 9, 1873.

TO SECRETARY OF STATE, *Washington, D. C.:*

Sealing steamer Walrus just arrived; reports steamer Tigress picked up on the ice off Grady Harbor, Labrador, on 30th April, fifteen crew of United States Polaris and five Esquimaux. Captain Hall died last summer. Tigress hourly expected. Will give further particulars.

T. N. MOLLOY,
United States Consul.

[Telegram No. 2.]

SAINT JOHN'S, NEWFOUNDLAND, *May* 9, 1873.

TO SECRETARY OF STATE, *Washington, D. C:*

Just returned from Bay Roberts, Captain Tyson having reached north latitude 82.16; reached winter quarters in September, 1871, in latitude 81° 38″, longitude 61° 44″. Captain Hall died of apoplexy 8th October, 1871; was buried about half mile southeast of ship's winter quarters. Crossed Kane's polar sea, said to be a strait about fourteen miles wide with appearances of open water north. Left winter quarters August 12, 1872; got on beam ends 15th same month; thence drove south to 77, 35 in ship, when, owing to heavy pressure of ice, vessel was thrown up, and while landing stores, &c., vessel broke away from her mooring, and part of crew now here were drifted away south. Vessel last seen under steam and canvas making for harbor on east side of Northumberland Island. Polaris is without boats; lost two in a northern expedition; two landed on ice with Captain Tyson; one burnt to make water for crew; the other now in Bay Roberts. Crew lost vessel on 15th October, 1872; were picked up last April by Tigress in latitude 53.30, having been 197 days on ice. No lives were lost when last on board ship. She made no more water than during past winter and fall, but had received heavy injury to stem, causing her to leak badly. Names of crew here are Captain Tyson, Frederick Meyer, John Heron, W. C. Kruger, Frederick Jamka, William Nindeman, Frederick Authing, Gustavus Linguist, Peter Johnson, William Jackson, the Esquimaux Joe, Hannah, and child, Hans Christian, of Kane's expedition, wife, and four children, (youngest only eight months old.) Polaris is in charge of Captain Buddington. Crew have lived on a few ounces daily, and latterly on raw seals, eating skins, entrails, and all for the past two months, and are all in fairly good health. Captain Tyson does not expect Polaris will get clear before July, if in condition to come home. There were fourteen left on board, with plenty of provisions, and, if vessel be not fit to come home, they can easily construct boats for their safety. All provided for in Bay Roberts; will come here Monday.

T. N. MOLLOY,
United States Consul.

[Telegram No. 3.]

SAINT JOHN'S, NEWFOUNDLAND, *May* 12, 1873.

TO ACTING SECRETARY OF STATE, *Washington, D. C.:*

No direct steamer for the United States. Tigress owners offer to convey Polaris crew to New York free of charge, if Government will charter her to go in search of missing portion of expedition; consider her most suitable steamer in every respect; could leave on Wednesday. Do crew come under head of destitute seamen? Which Department do I draw on for expenses? Are Esquimaux to be forwarded? Steamer Nestorian may call on Thursday on way to Halifax, if coast clear of ice. Passage to Halifax $20 each.

T. N. MOLLOY,
United States Consul.

[Telegram No. 4.]

SAINT JOHN'S, NEWFOUNDLAND, *May* 12, 1873.

TO SECRETARY OF NAVY, *Washington, D. C.:*

Tigress just arrived; all landed; shall send further particulars to-night.

T. N. MOLLOY,
United States Consul.

[Telegram No. 5.]

SAINT JOHN'S, NEWFOUNDLAND, *May* 12, 1873.

TO SECRETARY OF STATE, *Washington:*

All Polaris crew just landed; all cared for; wait answer for further proceedings.

T. N. MOLLOY,
United States Consul.

[Telegram No. 6.]

SAINT JOHN'S, NEWFOUNDLAND, *May* 13, 1873.

TO SECRETARY OF NAVY, *Washington:*

Crew of Polaris want $20 each besides clothing and boarding. Captain Tyson and Fred. Meyer, of signal-office, want funds also. Say amount I can advance on each account. Esquimaux and crew on sick-list to-day. Harbor blocked with ice.

T. N. MOLLOY,
United States Consul.

[Telegram.]

NAVY DEPARTMENT,
Washington, May 13, 1873.

UNITED STATES CONSUL,
Saint John's, Newfoundland:

Take care of Polaris crew. Draw on Department or on Jay Cooke, McCulloch & Co., London, as most advantageous, notifying Department by telegram. Will telegraph how they can come home when determined.

GEO. M. ROBESON,
Secretary of the Navy.

UNITED STATES CONSULATE,
St. John's, Newfoundland, May 13, 1873.

SIR: I have the honor to inclose herewith a copy of a communication received from the owners of the steamship Tigress in reference to an offer to the Government to convey to New York the crew of the steamship Polaris, and also a tender of the said ship, with terms, in the event of the Government intending to search for the missing members of the expedition.

I also have the honor to inclose copies of telegrams sent, connected with this circumstance of the disaster to the expedition, for the information of the Department, and I have made the necessary arrangements for the proper treatment of the crew, having advanced them what I considered requisite for their comfort under the trying circumstances in which they have been situated. Since their landing yesterday, there has been a material reaction as regards their health, and I find, from both medical and my own observation, that most of them begin to feel the injurious result of their long sufferings and hardships which they have endured, several of them giving way, and fear will not be well enough to proceed home for at least a fortnight. At present there is no conveyance offering to take them direct to the United States, and although the mail-steamer Nestorian is due to-night or in the morning, by which this is intended, via Halifax, yet, from the coast being blockaded with ice, and the wind prevailing from the east, pressing the ice on the shore, there is very little probability of the Nestorian getting in here, and will likely have to pass by to Halifax without coming in.

In the event of the Government requiring a steamer, there are several here well adapted for a northern voyage, and which could be purchased or hired for a month or years.

I sent a telegram yesterday stating that the crew wanted money, (account of wages,) also Captain Tyson and Fred. Meyer, of the signal station. Already advanced $300, and given it to Captain Tyson to be divided among them, and have taken his receipt for the same, the particulars of which shall be sent forward in due course. Captain Tyson and Meyer have intimated that they will require about $1,200 between them.

The next Allan line steamer from Liverpool is due here about the 26th instant, and will go direct to Baltimore, by which the crew can go, unless you order otherwise in the mean time.

I have the honor to be, most respectfully, your obedient servant,

THOS. N. MOLLOY,
United States Consul.

HON. SECRETARY OF THE NAVY,
Washington, D. C.

UNITED STATES STEAMER FROLIC, (4th rate,)
Navy-Yard, Washington, June 5, 1873.

SIR: I have the honor to report that, in obedience to your order of the 15th May, this ship, under my command, left New York on the evening of May 16, passed through Hell Gate, and arrived at Saint John's, Newfoundland, at 6 o'clock on the morning of the 22d.

The weather was generally good during the passage, but on the night of the 19th, while passing Sable Island, it became so thick that I was obliged to direct speed to be reduced on account of the fog, as well as

on account of passing a dangerous place. This prevented the ship from arriving at her destination on the 21st.

Cape Saint Mary and Cape Pine were sighted just after noon of the 21st, and Cape Race was rounded at 6 p. m. of that day.

Before reaching Cape Race, five large icebergs were passed, and during the following night one hundred and twenty were passed, including three floes of ice, the smallest of which I estimated to be about half a mile in diameter and the largest three or four miles. To avoid this ice the ship was kept well in-shore, which is steep-to. The ship was kept at low speed until day-light, as no one on board had been to Saint John's before, and no one was acquainted with the coast. I was unable to procure a Newfoundland pilot at New York.

The ship does not carry enough coal to burn more per diem than was used on the passage, and the complement of the ship is so small that there are not men enough to keep more fires going. On the passage east, twelve of the fourteen furnaces were kept going, and when in her best trim no more than ten knots were made.

Upon the arrival of this ship at Saint John's, I sent a letter to the United States consul at that port, asking for those persons rescued from the Polaris. The consul called upon me at once and stated verbally that the rescued people would be delivered before the ship sailed.

* * * * * * *

The day of our arrival was a religious holy-day, on which no labor could be had. The 24th being a national holiday, little could be done, and on Sunday no coal could be procured.

The intervention of these days delayed the ship. She had not received her coal until the evening of Tuesday, and sailed at 4 a. m. of Wednesday.

I did not leave Saint John's the latter part of the day on account of thick weather and ice, the latter this ship not being able to combat.

On the afternoon of the 27th I received nineteen persons of the crew of the Polaris, the list of whom is substantially the same as that furnished by the Department.

After passing Cape Race, at noon of the 28th, we were in a dense fog for fifty-three hours, except for a short time on the night of the 29th. The speed was consequently lowered on that account, as well as from the fact of having a strong head wind and heavy sea.

Distance was lost by cleaning the tubes, which the Cardiff coal frequently obstructed. No anthracite coal could be had at Saint John's, and there were but two lots of Cardiff coal, one of which was purchased. Native coal, I do not think, would have lasted the passage.

Sails were used to the best advantage. The Esquimaux are in two families, two male adults and the rest women and children. These are kept aft, and are occupying officers' apartments.

* * * * * * *

While at Saint John's I inspected, by request, the British steamship Tigress, and found, as far as I could judge, the representations of Messrs. Harvey & Co. to be correct as to her strength and construction. A copy of the letter from these gentlemen I forward.

Should it be the intention of the Department to dispatch a vessel to the polar regions, the Tigress is, in my opinion, the best one suited for that purpose.

To conclude, I regard the Frolic as one of the best and easiest seaboats I have ever been on board of, and I believe her to be as strong as ships built of iron usually are.

For a passage of a week or more the bunkers do not carry enough

coal for a consumption of more than about nineteen tons per diem, which, under favorable circumstances, will send the ship about two hundred miles.

The fact of not bringing back the boat of the Polaris is explained in my correspondence with the United States consul at Saint John's. This ship arrived at this port at 1.15 p. m. of this day.

I forward copies of correspondence.

I have the honor to be, very respectfully, your obedient servant,

C. M. SCHOONMAKER,
Commander United States Navy.

Hon. GEO. M. ROBESON,
Secretary of the Navy.

SAINT JOHN'S, *May* 10, 1873.

DEAR SIR: You are already aware that the steamer Tigress has returned to Bay Roberts, having rescued nineteen of the crew of the Polaris.

If it is the purpose of your Government to send in search of the other members of the expedition, we beg, on behalf of the owners of the Tigress, to say that she will be at their service, and is probably as suitable a vessel as any that could be built for that purpose.

We will undertake to convey the persons already on board her to New York, and then deliver the steamer up to your Government, who may appoint their own officers, engineers, and crew, send her to the Arctic regions, and then deliver her up to us in New York, when it suits their convenience, in as good order as when they received her.

If they deliver her up to us in New York during the present year, (1873,) to pay the Tigress for services already rendered, and probable loss of a trip of seals by leaving the ice to bring home these people, and for her use until delivered up to us in New York, $30,000, American currency; if she should be caught and have to winter in the Arctic regions and not be delivered up to us until 1874, $60,000; if she should be lost during the voyage, the Government to pay $60,000 for her, and hire up to the date of their acquainting us with her loss.

She is well found in everything necessary for encountering an Arctic voyage, having last year been for the whale season in Cumberland Inlet or Baffin's Bay.

The vessel, as you know, is eighteen months old, fully sparred, and plenty of sail, compound engines, burning six to seven tons of soft coal in twenty-four hours for a speed of eight knots; would require docking and provisions only to proceed on the voyage.

We are, dear sir, yours truly,

HARVEY & CO.

T. N. MOLLOY, Esq.,
American Consul.

P.S.—You might acquaint your Government of the probable value of some of the second [sealing] trips brought in this year.

The above copy of Mr. Harvey's letter was furnished me by T. N. Molloy, esq., United States consul at Saint John's, Newfoundland, May 27, 1873.

C. M. SCHOONMAKER,
Commander.

UNITED STATES STEAMER FROLIC,
Saint John's, Newfoundland, May 22, 1873.

SIR: I have been dispatched in command of this ship to this place to receive the party from the Polaris, including the Esquimaux, on board for transportation to the United States. I request you to deliver them to me for that purpose as soon as practicable, wishing to return at once where coal can be obtained.

You will please inform me if any stores or conveniences will be required for the health and comfort of these persons besides what is usually carried on board men-of-war, in order that I may procure the before leaving.

Very respectfully, your obedient servant,

C. M. SCHOONMAKER,
Commander United States Navy.

T. N. MOLLOY, Esq.,
United States Consul, Saint John's, Newfoundland.

UNITED STATES CONSULATE,
Saint John's, Newfoundland, May 22, 1873.

SIR: I have the honor to acknowledge the receipt of your communication of 22d instant; and, in reference to the boat belonging to the Polaris, she is now at Bay Roberts, and I have directed her to be delivered up to me by first conveyance from that place; but if not here in time to be sent by the Frolic under your command, shall keep her here until future orders from the Navy Department.

The canoe belonging to Joe Eberbing (the Esquimaux) will be sent on board, with three rifles and two bags of furs.

I have the honor to be, most respectfully, your obedient servant,

THOS. N. MOLLOY,
United States Consul.

C. M. SCHOONMAKER,
Commander, Commanding United States Steamer Frolic.

UNITED STATES STEAMER FROLIC,
Saint John's, Newfoundland, May 22, 1873.

SIR: I wish to inform you that I will receive on board and carry to the United States the boat and canoe which were brought to this port by a part of the crew of the Polaris.

Very respectfully, your obedient servant,

C. M. SCHOONMAKER,
Commander, Commanding.

T. N. MOLLOY, Esq.,
United States Consul, Saint John's, Newfoundland.

UNITED STATES CONSULATE,
Saint John's, Newfoundland, May 27, 1873.

SIR: Agreeably to your communication of the 22d instant I have the honor to deliver up to you the party rescued by the sealing-steamer Tigress, Captain Bartlet, belonging to the United States steamer Polaris

of the Arctic expedition, and also inclose herewith the names of the party as registered in this consulate.

I have the honor to be, most respectfully, your obedient servant,

THOS. N. MOLLOY,
United States Consul.

C. M. SCHOONMAKER,
Commander, Commanding United States Steamer Frolic.

List of persons rescued belonging to the Polaris, of the Arctic expedition.

George E. Tyson.
Frederick Meyer.
William Jackson.
J. W. C. Kruger.
Peter Johnson.
Hans Hendrick, wife and four children. } Esquimaux.
Joe Eberbing, wife and daughter. }
Frederick Jamka.
William Nindemann.
John Heron.
G. W. Lindguist.
Frederick Authing.

Saint John's, Newfoundland, May 27, 1873.

THOS. N. MALLOY,
United States Consul.

UNITED STATES STEAMER FROLIC, (4th rate,)
Navy-Yard, Washington, June 5, 1873.

SIR: I respectfully forward the list of passengers of this ship for the passage from Saint John's, Newfoundland, to this station. (Form No. 10.)

I have the honor to be, very respectfully, your obedient servant,

C. M. SCHOONMAKER,
Commander United States Navy.

Hon. GEO. M. ROBESON,
Secretary of the Navy.

Forwarded by—

L. M. GOLDSBOROUGH,
Rear-Admiral, Commanding.

List of officers or others arrived as passengers in the United States steamer Frolic. Dated at Washington, D. C., the 5th day of June, 1873.

Names.	Rank.	Remarks.
George E. Tyson....	Assistant navigator.	The names in this list are the same as furnished by the United States consul at Saint John's, N. F. This list is substantially the same as the one furnished by the Department.
Frederick Meyer....	Meteorologist.	
William Jackson....	Cook.	
J. W. C. Kruger.....	Seaman.	
Peter Johnson.....	Seaman.	
Frederick Jamka...	Seaman.	
William Nindemann.	Seaman.	
John Heron.....	Steward.	
L. W. Lindguist.....	Seaman.	
Frederick Authing..	Seaman.	
Hans Hendrick, wife and four children..	Esquimaux.	The list comprises that part of the crew of the Polaris who were rescued from the ice by the British steamer Tigress. These persons were received on board for passage to the United States at Saint John's, N. F., on May 27, 1873.
Joe Eberbing, wife and daughter.....		

C. M. SCHOONMAKER,
Commander, Commanding.

PROCEEDINGS OF THE JUNIATA IN THE SEARCH FOR THE POLARIS.

NAVY DEPARTMENT, *June* 19, 1873.

SIR: The Juniata is to proceed to Greenland to obtain tidings of the Polaris, to communicate with her, and to aid in her rescue. The steamer Tigress will shortly follow. Whenever the Juniata is ready for sea you will go direct to Saint John's, Newfoundland, fill up with coal, stowing as much on deck as can be conveniently carried, and, without further loss of time, make the best of your way to the port of Godhavn, on the island of Disco, on the west coast of Greenland, having due regard to the safety of your ship while navigating through a region in which more or less ice is usually to be met with at this season of the year. On arriving at Godhavn, communicate with the Danish authorities at that place, to whom you are furnished with letters of introduction, and ascertain if any intelligence has been received of, or from, the Polaris since October, 1872, when she was last seen, under Northumberland Island, in about the latitude 77° 13′ north, longitude 72° west.

Acting upon whatever information you may receive, or, in the absence of any, you will endeavor, with the aid of the Danish authorities, to open communication with the Polaris, by means of the Esquimaux, without delay. Any other measures for procuring intelligence of the Polaris, or for her relief and rescue, that may commend themselves to your best judgment, you are authorized to take, *except endangering your own ship and men within the ice.* Should, however, the navigation of Baffin's Bay be sufficiently open, as it at times is, to pursue it to the northward in an ordinary ship, you will carry the Juniata up the coast to Upernavik, and farther, if practicable, with safety, keeping a lookout for the Polaris, and for her people on the way. Should you be so fortunate as to rescue them, you will return to Godhavn, discharge all your obligations at that place, leave the requisite information for the Tigress, and return with all dispatch to New York; otherwise you will not leave Godhavn, to return homeward, until the last moment of the navigable season in the fall.

Upon falling in with the Tigress you will aid her in her search to the northward, as far as you can proceed together, unless you have already rescued the party; and when you part company if she has to go on to the north, make the best arrangements you can for awaiting her return, either at Upernavik or at Godhavn, beyond any risk to the Juniata from the ice. The Tigress is to push on for Northumberland Island if the Polaris, or her people, are not met with lower down; and, in that case, is not to fail to reach the island, even if she may have to winter in its vicinity. If the Polaris is reached she is not to be abandoned, if it is possible to bring her out; but, if she cannot be saved, her officers and men, and everything of value, are to be removed to the Juniata, or to the Tigress, as may be most convenient. If rescued she is to come homeward under the convoy of both the Juniata and Tigress, until clear of all danger from the ice, when you will hasten your own arrival at your destination, leaving the Tigress to convoy the Polaris into port.

The coal and stores which were landed at Godhavn by the Congress, for the Polaris, are to be used to the best advantage. Coal may, perhaps, be obtained at or about that port, if needed. Communicate with the Department whenever an opportunity offers.

At Saint John's you will fill up the Juniata with soft coal, such as is

requisite for the use of the Tigress. This coal you will supply the Tigress with at Disco, or leave it there for her. In the execution of the duty to which you are assigned by these orders, much must be left to your judgment; and the Department here reminds you that in no event must you put your vessel, or the lives on board of her, in any jeopardy from the ice, for which the Juniata has not been built, or repaired, or specially fitted. Inclosed herewith is a letter from the Danish minister to the Danish authorities in Greenland, asking them to render you all assistance and co-operation with the expedition under your command.

Respectfully,

GEO. M. ROBESON,
Secretary of Navy.

Commander D. L. BRAINE, U. S. N.,
Commanding United States Steamer Juniata,
United States Navy-Yard, New York.

NAVY DEPARTMENT,
Washington, July 10, 1873.

SIR: Should the Tigress join company with the Juniata, her commander is directed, as usual, to show his instructions to his senior officer, and the Department desires you to assist in carrying out these instructions in every way, and particularly to facilitate his progress to the northward by every means in your power, keeping in mind the fact that the Tigress is fitted and ordered to make her way, if necessary, to the point where the Polaris was last seen, by every means possible and in the face of every danger, while you are ordered only to advance as far in that direction as you may be able to go without subjecting your ship to more than ordinary risk and danger, and the fact that the Tigress is fitted to encounter the ice, while you are not. Should you be in company when you meet the ice, or enter the latitudes where it may be dangerous, you will not detain her with you if her commander thinks it proper to push on, but will allow her to proceed at his own discretion, having informed him where he may expect to find or communicate with you on his return to Godhavn.

Your orders in respect to the Juniata are full and complete, and the Department further depends upon you to advance and further in every way the special object for which the Tigress is fitted out, and to facilitate her advance northward as the special expedition upon which the Department relies for the relief and rescue of the Polaris, her officers and crew, should they prove to be beyond the reach of assistance by the ordinary naval means which may be afforded by the Juniata under her orders. As the officers and crew of the Tigress have been selected with special reference to the circumstances of the case, you will not interfere in any way with her *personnel*, except at the request of her commander or under the pressure of imperative professional necessity; and should she be fortunate enough to rescue the Polaris and afterwards join you, you will permit her to convoy her home.

Reminding you that the season of operations is necessarily short, and that every necessary measure at your command must be taken in the most prompt and effective manner,

I remain, your obedient servant,

GEO. M. ROBESON,
Secretary of the Navy.

Commander DANIEL L. BRAINE,
Commanding U. S. Steamer Juniata, (By U. S. Steamer Tigress.)

No. 25.] UNITED STATES STEAMER JUNIATA, (3d rate,)
Off Battery, New York, June 24, 1873.

SIR: I have the honor to report to the Navy Department that, in obedience to its orders of the 19th and 23d instant, I have sailed with this vessel under my command this day from this port in search of the Polaris.

I am, sir, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., Commanding Juniata.

HON. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

No. 30.] UNITED STATES STEAMER JUNIATA, (3d rate,)
Saint John's, Newfoundland, July 9, 1873.

SIR: I have the honor to report the arrival of the United States steamer Juniata, under my command, at this port, June the 30th, and this being the first opportunity of communicating by mail, I avail myself of it. Your telegraphic dispatch of the 29th of June was duly received.

Since my arrival here, I found that several sheets of the thin sheet-iron placed on the bows of this ship at New York had washed off. After consultation with the ice-pilot, I have had the bow properly sheathed and prepared for meeting the ice through which I may have to run the ship between here and Upernavik.

* * * * * * *

I beg leave to report that our national holiday was duly observed as such by decorating the ship with flags and a holiday for the crew.

Having made all the preparations for sea, I shall sail this day for Greenland, in search of the Polaris upon my way, and in obedience to your written and telegraphic orders.

The health of the officers and crew, I have the pleasure to say, is excellent.

I am, sir, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., Commanding U. S. Steamer Juniata.

HON. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

No. 31.] UNITED STATES STEAMER JUNIATA, (3d rate,)
Holsteinborg, Greenland, July 19, 1873.

SIR: I have the honor to report, since my letter of the 9th instant, written from Saint John's, New Foundland, that on July 14 I arrived off Fiskenaes, but, being unable to get a pilot, I proceeded to Sukkertoppen, which port I entered on the 17th instant, and found that no dogs were to be procured. July 18, sailed, and arrived at Holsteinborg the same day.

I have this day, through the courtesy of Governor Frederick Larssen, procured eighteen dogs, also one hundred and fifty seal-skins to make clothing for the men and officers of the Tigress, and I shall sail, weather permitting, to-day for Disco, where I will land the soft coal for the

Tigress, and then proceed to Upernavik in the execution of your orders.

As yet, and I have news from Disco up to the 10th instant, no tidings have been received from the Polaris.

The ice is reported very heavy in Omenak Fiord and at and above Upernavik.

The health of all the officers and crew of this vessel is excellent.

I have the honor to be, very respectfully, your obedient servant,

D. L. BRAINE,

Commander U. S. N., Commanding U. S. Steamer Juniata.

Hon. GEORGE M. ROBESON,

Secretary of the Navy, Washington, D. C.

P. S.—This letter is sent per Danish brig Constance, via Copenhagen, Denmark.

No. 32.] GODHAVN, DISCO ISLAND, GREENLAND,
July 29, 1873.

SIR: I have the honor to report, since my last communication of the 19th instant, I have proceeded, with the United States steamer Juniata under my command, to this port, where I have just landed about seventy tons of Cardiff coal for the use of the Tigress, the same carefully bagged and placed in the store-house. I also landed a quantity of lumber, which, I have no doubt, will be of great use to her. I have also landed the eighteen dogs purchased at Holsteinborg, besides twelve additional ones procured here, and I leave here directions to have them all delivered to the Tigress. I would here note that I find all the stores left here by the Congress and Polaris apparently to be in good order. I have also taken from the store-house $55\frac{550}{2240}$ tons of anthracite coal for the use of this ship.

My previous communication was dated July 19, Holsteinborg, and was sent per Danish brig Constance, via Copenhagen. The seal-skins which we procured at that port, from which we sailed July 21, 1873, are now being prepared here, to be made into clothing for the officers and men of the Tigress. I found it impossible here to procure any furs for the same purpose, but at Upernavik I am in hopes to obtain all that I desire.

It is my intent this day to sail for Upernavik, where I will endeavor to obtain information of the Polaris by sending out Esquimaux, with liberal offers of money or other articles as inducements for them to go, if possible, to obtain information of her whereabouts, so I may impart the same to the commander of the Tigress immediately upon her arrival. Should I not have the desired information, and the navigation is open to the northward, I will then accompany the Tigress as far to the northward as it is prudent for this ship to go; and I would here state that I am informed that, although this last winter in these regions has not been so mild as the two preceding ones, it has by no means been severe, and it is very likely the ice of Baffin's Bay has been adrift the whole winter through.

When we separate it is my intention, as far as present information warrants, to return to Upernavik, and remain there as long as open navigation will permit, say until August 30, upon which date I will proceed to Godhavn, Disco Island, and remain at that port until September 20 or 30, and then proceed to Holsteinborg, where I propose to wait until

the latter part of October, at which point, by the following proposed means, I have hopes to bring you intelligence of what the Tigress may have accomplished, and the whereabouts of the Polaris or her officers and crew. I will arrange with Commander Greer, if the Tigress be frozen in to the northward of Upernavik, that he will send Esquimaux with information to Upernavik; from that point Esquimaux will bring it to Godhavn, Disco Island, and from there to me at Holsteinborg, from which port I will sail for Saint John's, Newfoundland, proceeding under sail, as my coal will probably be exhausted by that date.

I have the honor to report that we have been received with much courtesy and kindness at this place, and every facility afforded us by Mr. Müldrüp, the assistant governor, in the absence of the governor, Mr. S. T. Krarüp Smith. The health of the officers and crew of this ship is excellent. The original of this was sent per Danish bark Thorwaldsen, via Copenhagen.

I am, sir, very respectfully, your obedient servant,

D. L. BRAINE,

Commander U. S. N., Commanding U. S. Steamer Juniata.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

No. 34.] UNITED STATES STEAMER JUNIATA, (3d rate,)
Off Upernavik, Greenland, August 10, 1873.

SIR: I have the honor to report, since my last communication from Godhavn, island of Disco, Greenland, under date of July 29, 1873, I have proceeded to this place with the United States steamer Juniata under my command, arriving July 31.

I will now proceed to give you in detail up to this date all that I have done at this place in carrying out your orders of June 19, 1873.

The seal-skins procured at Holsteinborg, and prepared at Disco, were landed the day of my arrival, and, with others procured here, will be made up into clothing for the officers and crew of the United States steamer Tigress, and be finished, I hope, before her arrival, so no delay may occur in their proceeding to the northward. I have ordered the clothing under advice from the authorities here, as otherwise the Tigress would be delayed two weeks or more in procuring it.

After consultation with Governor Rudolph, of this place, (who has rendered me every facility in forwarding the expedition in search of the Polaris,) I found it impossible to arrange with the Esquimaux to proceed to the northward in search of the desired information of the officers and crew of that vessel.

Governor Rudolph informed me that the navigation to the northward was and had been unusually open this year, and free of floe-ice; that, indeed, as he expressed it, "there had been no winter." He assured me if I dispatched a steam-launch he could furnish her with a thoroughly competent Esquimaux pilot, who is a dog-driver and hunter also. I then decided to send the large steam-launch of this vessel, (and I may here state that, anticipating a search to the northward, in obedience to your orders, would have to be successfully accomplished under steam, I had the steam-launch prepared by sheathing her with wood, placing iron on her bows, and an iron guard or frame around her propeller,) to skirt the fast ice of the coast, to obtain all the information she could, and return by August 15, 1873, or before the Tigress would proba-

bly reach Upernavik. She was supplied with a most thorough outfit to make the reconnaissance. August 2, 1873, Lieut. George W. De Long, navigator of this vessel, was assigned to command her, and she was named the Little Juniata; lieutenant, Charles W. Chipp; ensign, Sidney H. May; pilot, Henry W. Dodge; boatswain's mate, Richard Street; machinist, Frank Hamilton; William King, seaman extra; and Martin T. Maher, ordinary seaman, and an Esquimaux pilot, named Jacob, formed the officers and crew, who, previous to starting, were each furnished with complete suits of fur clothing. The steam-launch was provisioned for sixty days full and one hundred and twenty days half ration; had coal for seventeen days' full steaming, and she sailed on August 2 for Tessuisak, from which point she sailed August 3 to the northward. At this date, August 10, she has not yet returned, but the weather has been excellent, and I feel confident she will soon be here.

At this place I met Inspector S. T. Krarüp Smith, of Disco, who furnished me with the following information: Early in June, 1873, two English steam whale-ships, named the Eric, Captain Walker, and the Arctic, Captain Adams, on board of the latter, Commander A. H. Markham, of the royal navy, stopped at Disco, and Inspector Smith told them the news of the rescued party, and, with great forethought, requested them to look along the ice for the Polaris, or her officers and crew, in their passage to the northward, which the captains of these vessels kindly promised to do. Hence, if they skirt the ice to the westward, in Baffin's Bay, which they have probably done by this time, and the Little Juniata looks along the coast, the Tigress can proceed in the most direct and expeditious route to Northumberland Island; and I am sanguine that, with these three modes, the ship or her officers and crew will be rescued from their perilous position, although as yet nothing has been heard from them at this point.

I have further to state that another vessel, the Ravenscraigh, has proceeded to the northward on a whaling voyage, and has also been requested to keep a lookout for the Polaris.

Upon inquiry I am informed that it will be impossible to get the Esquimaux of this place to proceed in a kayak to Godhavn, Disco, after September 1; hence it will be impossible for me to get information from this place after that date, unless I am successful in inducing the governor of this place to send one of his sailing-vessels to that point. I have it in my mind, and may probably order our large steam-launch, upon her return to this point, to await for news until a certain day in September, and bring it to me at Disco, if so obtained. Should the Tigress successfully return, she can, of course, convey the launch to Godhavn.

After leaving this point it is my intent to obtain, if possible, coal from the mines on the island of Disco, opposite to Rittensbek. I shall also, if the inspector, Governor S. T. Krarüp Smith, consents, send a 50-ton sailing-craft to the westward of Godhavn, to search along the pack-ice for the Polaris, which vessel he thinks may be inclosed in it and drifting to the southward.

* * * * * * *

Should I not get the desired coal on Disco Island upon my return to the United States, I may probably have to stop at Iviktout, with the double object, first, to obtain information of the Polaris, should she have got out of the pack-ice in the neighborhood of Holsteinborg or Sukkertoppen, as Inspector Smith informs me she would probably go to Iviktout; secondly, to obtain coal for this vessel, and in order to know what facilities there are for procuring the same, and to obtain information of

the Polaris. Upon the advice of Inspector Smith, I shall in a few days dispatch an Esquimaux in a kayak to Sukkertoppen, Holsteinborg, and Iviktout, to return to Godhavn, Disco, with information on these two points, viz, as to whether the Polaris has been heard from at those two places, and whether coal can be procured at Iviktout.

I am happy to state that we have thus far successfully navigated, with very imperfect charts, through dense fogs amongst innumerable icebergs and unknown islands and rocks, and had several very narrow escapes, arising from the dense fog, although we have thus far been favored with continuous daylight. The ship is in good order, but short of coal.

I cannot definitely state when I will sail for Saint John's, Newfoundland, as so much depends on the success or non-success of the Tigress or the Little Juniata, or the sudden appearance of the Polaris herself; but you may rest assured that your orders will be carried out, as far as it is in my power, with great earnestness. The health of the officers and crew is excellent.

I send this communication via Iviktout, Greenland, and the original via Copenhagen, Denmark, per Danish bark Thorwaldsen.

I am, sir, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., Commanding U. S. Steamer Juniata and Senior Officer Present.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

P. S.—I deem it my duty to mention that Lieut. Commander Edgar C. Merriman volunteered to go with the steam-launch and search for the United States steamer Polaris to the northward of this place, but Lieutenant De Long having previously volunteered, I had promised him, if I sent her, he should be the officer assigned for that duty.

D. L. BRAINE,
Commander U. S. N.

No. 35.] UNITED STATES STEAMER JUNIATA, (3d rate.)
Off Upernavik, Greenland, August 12, 1873.

SIR: I have the honor to inform you that the United States steamer Tigress, Commander James A. Greer, U. S. N., commanding, arrived here August 10. She was filled up with coal from the Juniata, and provided with everything she required.

David M. Howell, machinist, and Thomas Hovington, seaman, condemned by medical survey, (sick,) were received from her; also, S. Harding, (seaman,) complained of by Commander Greer as a skulk and worthless; and in their places I have transferred from this vessel to the Tigress the three following named, who are excellent men: Thomas Craven, machinist; Peter Newman, seaman; and Peter Brown, landsman, accompanied by their necessary transfer papers.

At 5.15 p. m. the 11th of August the Tigress steamed away north for Tessiusak in the performance of your instructions. We all gave her our heartiest good wishes and cheers. I will wait at this place until the 20th instant in hopes to hear from the Tigress.

I inclose herewith, for the information of the Department, a copy of the orders issued by myself, as senior officer present, to Commander Greer previous to the sailing of the Tigress from this port.

The original of this was sent via Iviktout, Greenland, to reach an American vessel returning to the United States.

I am, sir, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., Commanding U. S. Steamer Juniata, and Senior Officer Present.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES STEAMER JUNIATA, (3d rate,)
Off Upernavik, Greenland, August 11, 1873.

SIR: Having reported the United States steamer Tigress under your command ready in every particular for the search for the United States steamer Polaris, you will be pleased to sail immediately and carry out the instructions of the honorable Secretary of the Navy.

The steam-launch of this vessel sailed from this place August 2, 1873, upon a reconnaissance to the northward, to obtain information, if possible, of the Polaris for the Tigress, with instructions to return in fifteen days, or by the 17th of August, if possible.

You will, upon your route toward Cape York, be pleased to keep a lookout for her, as she may have valuable information for you; and should you fall in with, render her, her officers and crew any assistance they may require; and should she be able to prosecute her voyage of return, be pleased to direct her commanding officer to do so with all despatch to this place, where I shall await him until August 20, at which date I shall leave for Waigatt Strait, to obtain, if possible, coal for this ship. From that point I go to Godhavn, Disco Island, where I shall await the return of the Tigress, under your command, until the latest navigable moment of this year, when I will sail for Saint John's, Newfoundland. You will be pleased to communicate with the above places, should you return this year.

With the sincere hope and wish you may be successful in your search for the United States steamer Polaris, her officers and crew,

I am, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., Commanding U. S. Steamer Juniata, and Senior Officer Present.

Commander JAMES A. GREER, U. S. N.,
Commanding United States steamer Tigress,
Off Upernavik, Greenland.

No. 36.] UNITED STATES STEAMER JUNIATA, (3d rate,)
Godhavn, Disco Island, Greenland, August 16, 1873.

SIR: I have the honor to inclose herewith the report of Lieut. George W. De Long, United States Navy, who commanded the search expedition sent from this ship to Cape York in search of the United States steamer Polaris, her officers and crew, to carry information to them, if found, of coming relief, and also to obtain information for the United States steamer Tigress, so she might proceed direct as possible and carry out your orders.

Lieutenant De Long and party encountered very heavy ice near Cape York, and turned to the southward August 9, 1873, in obedience to my

orders, (a copy of which I herewith inclose.) August 12, 1873, the steam-launch (Little Juniata) met the United States steamer Tigress off Tessuisak and imparted to her commanding officer, up to August 9, 1873, valuable information of the condition of the ice, both going to the northward by the coast-line, and returning through Melville Bay.

I beg leave to commend the officers and men who were with Lieutenant De Long upon this extra-hazardous expedition to the favorable consideration of the Navy Department; the former are deserving of acknowledgment and, praise, and in addition thereto, I recommend for the latter medals of honor for fidelity, zeal, and obedience.

I beg leave to report I sailed from Upernavik August 13, 1873, and arrived at this port August 15, where I shall wait to obtain information from both the Tigress and Polaris, or, in case of their arrival here, to accompany them to the United States, in obedience to your orders of June 19, 1873.

The health of the officers and crew of this vessel is, I am happy to say, excellent.

In conclusion, I trust all that has been done by me to carry out your orders will meet with your approbation.

This letter goes forward by the Danish brig Thorwaldsen, via Copenhagen, Denmark, and a duplicate of the same via Iviktout, Greenland, per an American vessel.

I have the honor to be, sir, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., Commanding U. S. Steamer Juniata,
and Senior Officer Present.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

P. S.—I also inclose a track-chart of the steam-launch track. I would also state that previous to our leaving Upernavik the ice formed in the fresh-water ponds on shore, and that here at this date we have had storms of snow and sleet, which seem to me to be indications of the approach of an early and severe winter.

D. L. BRAINE.

UNITED STATES STEAMER JUNIATA, (3d rate,)
Upernavik, Greenland, July 31, 1873.

SIR: The Little Juniata, the largest steam-launch of this ship, has been carefully strengthened with outer planking, also with an iron stem-plate, and her propeller guarded with an iron frame. She is thoroughly equipped, arranged, and provisioned for sixty days, under your supervision, for a search for the United States steamer Polaris along the fast in-shore ice to the northward of this place toward Melville Bay. You will assume command of her, and at the first appropriate moment proceed to carry out said search as far as it is positively prudent to advance to the northward.

In navigating these northerly and almost unknown waters much must be left to your discretion, and your movements must be controlled by the short time the United States steamer Juniata will remain at Upernavik, which is until August 25, 1873.

You are enjoined to advise with the ice-pilot furnished you, who has twice passed over the waters you are about to navigate, and wintered in the Arctic frozen regions.

The Little Juniata is not to be jeopardized or pushed into the ice-packs if you meet them; nor is she or the lives of those on board to be involved in any way it is possible to avoid, for you must remember that the United States steamer Tigress, a vessel equipped and prepared for ice-cruising, will soon proceed up Baffin's Bay into Smith's Straits, to search for the Polaris, up to the point she was last seen (Northumberland Island) in October, 1872, and you are reconnoitering previous to her going, possibly to pass an Arctic winter in 77° north.

Should you find the Polaris, or her officers and crew, you will return with dispatch to Upernavik, at which place the Juniata will remain up to the date previously mentioned; and you are not, under any circumstances within your control, to be absent from this ship beyond fifteen days, for which time you have coal, at a daily consumption of 500 pounds.

Should you not find the Polaris by the time you have consumed one-half of your coal, you are to return to Upernavik, and sooner if you meet any formidable ice obstructions.

Should the United States steamer Tigress leave Upernavik before you return, she will be directed to keep a lookout for you, and should you meet her under any circumstances that warrant it, you will remain with her if her commander deems it most prudent you should do so; but should the Little Juniata be able to prosecute the voyage of return to Upernavik, I wish you to do so, and be at that place on or before August 25, 1873.

Should you not be at Upernavik by that date, I will leave there coal and provisions sufficient for your return to Godhavn, Disco Island, where I expect to remain until September 20 or 25, or the latest days previous to the close of navigation by the ice in these waters.

With hopes your search will prove successful and you may find the Polaris, or gain some tidings of her, or be the means of conveying through the Esquimaux to those on board the news of the vessels now in search of her, I sincerely wish you success in your undertaking.

I assure you I shall wait with great interest your return to this ship from the hazardous duty for which you and those associated with you have volunteered.

You will be accompanied by Lieut. Charles W. Chipp, U. S. N.; Ensign Sidney H. May, U. S. N.; Pilot Henry W. Dodge; Richard Street, boatswain's mate; Frank Hamilton, machinist; William King, seaman extra; Martin T. Maher, ordinary seaman.

I am, most sincerely, yours,

D. L. BRAINE,
Commander U. S. N., Commanding U. S. Steamer Juniata, and Senior Officer Present.

Lieut. GEORGE W. DE LONG, U. S. N.,
Commanding the Steam-Launch Little Juniata.

UNITED STATES STEAMER JUNIATA, (3d rate,)
Upernavik, Greenland, August 12, 1873.

SIR: I have the honor to submit to you this my report of an expedition in the steam-launch Little Juniata, under my command, to the northward as far as Cape York, in search of the missing steamer Polaris, which expedition left this ship on the 2d instant and returned at 8 o'clock this evening.

The expedition was prepared by your order, and the necessary detail

of arrangements (such as strengthening the boat with wooden sheathing, fitting a stem-plate of iron, an iron frame or guard for the screw, purchase of canned provisions in sufficient quantities to last eight people sixty days, the internal fittings of the boat with reference to stowage of fuel, &c., the arms and ammunition necessary, spars, sails, and spare machinery) was by you committed to my care and carried forward under my personal supervision during the stay of the ship at St. John's, Newfoundland, and Disco Island, Greenland.

The party consisted of the following-named persons in addition to myself: Lieut. Charles W. Chipp, United States Navy; Ensign Sidney H. May, United States Navy; Mr. Henry W. Dodge, ice-pilots Frank Hamilton, machinist; Richard Street, boatswain's mate; Martin T. Maher, ordinary seaman; William King, ordinary seaman, engineer'; force; and Jacob Lynghe, Esquimaux, who accompanied us as an interpreter and coast-pilot between Upernavik and Cape Shackelton.

On Saturday, August 2, at 12.55 p. m., the boat being in readiness, provisioned, and supplied with four tons of anthracite coal, I received your final orders and shoved off from the ship, with the dingy contain ing twelve hundred and seventy-eight pounds of coal in tow, and, heartily cheered by the ship's company, proceeded on our voyage to the northward, under steam, with a fine breeze from the southwest.

I immediately organized the party and divided them in two watches, one in charge of Lieutenant Chipp, and consisting of himself, Mr. Dodge, Hamilton, and Street, and the other in my own charge, and composed of the remaining four of the party, the Esquimaux being for the present excluded. This arrangement of watches was kept up during our entire absence, the officers and men working alike, and turning in and out with each other.

At 3.30 the same afternoon we passed the small settlement of Kingitok, about twelve miles to the northward, and working our way among countless icebergs and through narrow passes between islands, arrived without accident at Tessuisak at 11 o'clock that night, and, in obedience to your orders, left the dingy at that place to be brought back by a Danish boat, landed six hundred pounds of coal from her for our use on returning, took the remainder into the launch, and were ready to depart at midnight. The weather, however, had set in bad, blowing fresh from the southwest, with a thick fog, and I deemed it prudent to wait until morning, or until there was some chance of working through the fog with safety.

Tessuisak is a small place of some half dozen Esquimaux huts, besides the house in which the chief trader, Jensen, resides. Jensen is the Dane who accompanied Dr. Hayes on his several expeditions as a dog-driver and hunter, and is apparently an excellent man, speaking English well, and willing and anxious to be of service to Americans, of whom he speaks in the most enthusiastic terms. At his hands we received a warm welcome and such hospitalities as his recent arrival and consequent unsettled condition would permit. Tessuisak has a small harbor, but it is nearly always full of icebergs, and we were forced to anchor among them, too close for comfortable contemplation, and with the chance of any one of them turning over upon us. The night being rainy and comparatively warm, (45°,) many icebergs broke up, and the cracking and breaking and turning over and over continued during our entire stay.

At 10 a. m., Sunday, August 3, the fog having lifted to some extent, we got under way and steamed away to the northward, passing in between Brown Island and the main land, working our way among ice-

bergs, and keeping close in to the main land to keep in smooth water and to be ready to slip in and anchor should a fog overtake us. At 4 p. m. had passed Cone Island and Wedge Island to the westward, and sighted Cape Shackelton and the Horse's Head, a prominent island off this cape, right ahead. Passed to the eastward of the island, and at 8 p. m., having Cape Shackelton close aboard, determined the position of the boat to be in latitude 73° 42′ north, longitude 57° west.

I had calculated before leaving the ship that we should be enabled, with an expenditure of five hundred pounds of coal per day, to make an average speed of four knots per hour under a steam-pressure of twenty pounds, and with the view to keeping the feed-water for the boiler as fresh as possible, a steam-pipe had been carried from the boiler to the water-tank, for the purpose of melting fresh-water ice which we should pick up on the way and put in the tank. We found upon trial thus far that the expenditure of steam to melt the ice was too great to keep up our proposed speed; and I concluded to supply the boiler with salt water, which of course we had to dip up from the water outside. Running with salt water increased our expenditure of fuel, and I now feared that instead of coal for fifteen days, as originally calculated, we would have only enough for eight days. With our sails we may be able to do better should we be favored with fair winds. This day we had light northerly winds, smooth sea; average temperature of the air, 45°; of the water, 41°.

At 4 a. m., Monday, August 4, passed inside of the Duck Islands, Baffin's Island bearing true southeast; weather thick, breeze coming up fresh from northward and westward, and cloudy, with indications of coming fog. This state of affairs continuing, at 3 p. m. I kept the boat away to the eastward, made sail, and stood in for a headland which, from its position and my calculation of the boat's run, I assume to be Wilcox Head, in about latitude 74° 40′ north. In getting under the headland, the fog continuing, we made the boat fast to an iceberg, and waited for a clearing up. At 5 p. m., the fog clearing, we slip from the berg and round the headland to the northward. My object in keeping in close to the shore now, though we were working through icebergs, was to get a sight of the Devil's Thumb, a remarkable pillar of land north of Wilcox Head, and from which I intended to take a fresh departure for crossing Melville Bay. But on rounding Wilcox Head we saw nothing of the Devil's Thumb, and I imagine I might have been deceived in the boat's position in the afternoon. Our accommodations were so limited, the boat had to carry so much, and the difficulty, not to say danger, of getting outside of the boat, was so great that the log could not be hove with any accuracy, and our reckoning was at the best not the most reliable. The currents set us out of our reckoning frequently, sometimes being to the northward and sometimes to the southward.

It is well to note here, for the information of any who may get into Allison Bay, that the chart is wrong in leaving it to be imagined that the bay is free except as to icebergs. It is filled with small islands, running along about fifteen miles from the glacier line, and extending from Cape Seddon nearly fifteen miles to the southward, toward Wilcox Head. It was the presence of these islands which confused us in reference to Wilcox Head.

Discovering another high headland to the northward of the supposed Wilcox Head, I stood on, getting in tolerably open water; and having a smooth sea and no wind, with clear sky, we headed for this new highland. On going below at 8 p. m. I directed Lieutenant Chipp to call me when nearly up with this headland, or in case of any change in the

weather. At 10 p. m. Lieutenant Chipp called me, a fog having shut in, the land being entirely obscured, and much ice being encountered in the shape of pack-ice and icebergs, and some new ice an inch in thickness. I immediately put about and attempted to retrace our way, which we succeeded in doing for several miles, but finally, owing to the increasing thickness of the fog, we missed our track, and were brought to a standstill in the pack. As far as we could see we were caught in solid ice, about from one to two feet thick, with large hummucks and icebergs surrounding us. By steady ramming of the ice and working a clear space about us, we occasionally made small cracks in the floes, and succeeded in forcing our way a little at a time, getting occasionally in open patches of water, and among loose ice, and making two or three miles before being brought up again by solid ice. I had headed the boat to the westward on losing our way in the ice, and I knew that every foot we made in that direction was toward the open water. The temperature was from 30° to 32°, the rigging was covered with ice, and the new ice was rapidly forming around us and increasing in thickness. I did not dare to stop for a clearing up of the fog, lest we should be firmly frozen in, and so kept the boat under way with full steam pressure, grinding through the ice where we could, ramming it wherever there was a chance of success, and following every little lead to the westward.

In all this I was guided by Mr. Dodge, the ice-pilot, whose previous experience in the Arctic regions enabled him to give me good advice, and upon whose judgment in this emergency I relied, and handled the boat accordingly. The plan of keeping to the westward proved a wise one, for at 8.30 a. m. we were rewarded by coming into quite large spaces of open water, and at 9 a. m., were pleased to detect a little swell, giving indications of our approach to the open sea beyond. By 10 a. m. we were quite clear of the pack after our twelve hours of uneasiness, and with no more damage to our little craft than a slight scratching and splintering of our strengthening plank, occasioned by the new ice through which we forced during the night.

I immediately headed the boat to the northwest true, (northeast magnetic,) and the fog clearing up by noon, we sighted at 2 p. m. three islands on our starboard quarter, the Sabine Islands, marked on the chart as being in latitude 75° 28′ north, longitude 59° 55′ west. At the same time made out the glaciers beyond to the northeast, a large number of icebergs, and a curious looking hill with two peaks, which no doubt is the Cape Walker marked on the chart, or land in its immediate vicinity. Generally speaking, the chart is inaccurate to a great extent to the northward of Cape Shackelton—the coast-line as we found it being nearly always a glacier line. To the best of our ability to see and judge, the ice-pack was tolerably solid from these Sabine Islands to the coast, showing that we were not far removed from the edge of the Melville Bay pack. The entire bay was dotted with clusters of icebergs.

Between 4 and 6 p. m. we were favored with a light fall of snow, the thermometer standing at 42°, with a light southeast wind and swell.

Knowing that everything that could be accomplished by the boat must be done in fine weather, and that it would be well to keep a hold on the land as much as possible, owing to the uncertainty of our position and the inaccuracy of the chart, I determined to push on with greater speed, in order to be near the land as possible, which was at its nearest point about fifty miles distant, and to this end fired up afresh, making a large hole in our fuel.

At 8 o'clock the next morning, Wednesday, August 6, we had no land

in sight ahead, but we found ourselves on the edge of the ice-pack, with a thick fog shutting in and no signs of a lead through. At about 11 a. m. land showed itself abeam, bearing northeast true, in the shape of two high hills, which Mr. Dodge recognized as the Peaked Hill, marked on the chart as being in latitude 76° 18′ north and longitude 62° west. Just as we sighted this land Mr. Dodge discovered a lead in the pack to the westward; but the fog shutting in thicker than ever, we were unable to follow it, and I decided to anchor to an iceberg rather than risk the boat on the edge of the pack. We accordingly made our ice-anchor fast at 1 p. m., but discovering the berg to be full of cracks and looking very much like breaking up, I shifted our anchorage to a small ice-cake and banked fires.

At this point I took an account of fuel remaining, and calculated that it was very nearly half gone. We had accomplished this distance without any more serious mishap than our danger of being firmly caught in the ice in Allison Bay. Cape York was only forty miles off, and the people of the Polaris might be there waiting for relief. In the foggy state of the weather burning coal without advancing would be a waste of fuel, and I decided to let the fire go out under the boiler, hoping to accomplish something under sail should the fog lift, or a chance present itself of getting open water to the northward. Accordingly, in the morning of Thursday, August 7, we let the fire die out. The thermometer was at this time at 38°, but we suffered no additional inconvenience on that account.

During the forenoon it promised several times to clear up, the sun showing itself occasionally for a few moments, but with little or no effect on the fog. Becoming tired of inaction, we slipped from the ice at 9.45 a. m., and, making sail, stood to northwest with a light southeast wind and swell.

At noon I determined the position of the boat to be in latitude 75° 52′ north, longitude 64° 05′ west, by our dead reckoning, and the last bearing we had of the land in the neighborhood of the Peaked Hill. At 4 p. m. came in sight of the ice-pack again, and immediately hauled the boat up to west-northwest true. Discovering a lead in the pack to the northward and westward, stood into it for about five miles, until Mr. Dodge pronounced it a false lead, the ice closing in ahead about four feet thick, some being last year's ice and some older. Brought by the wind and beat out of the lead. At 8 p. m. the wind freshened from south-southeast, and we commenced to work to the westward, as much as possible keeping clear of the ice. At midnight hauled alongside of an iceberg to fill up with fresh-water ice for drinking and cooking. Moderate sea.

At 1.30 a. m., Friday, August 8, sighted high land bearing northwest by north true, and trending away to the northward in an apparently low neck. This, Mr. Dodge pronounces our anxiously looked for Cape York; and at 2.30 a. m., having worked clear of detached pieces of floe-ice, stood in toward the land, which we calculated to be about eight miles distant. At 3 o'clock a. m. the fog shut in again thick and we lost sight of Cape York, at the same time the wind freshened to a gale from southeast and I was compelled to bring the boat by the wind and reef down as snug as possible. At this time had we been in open water, Cape York could have been reached without any difficulty, but as far as we could see to the northward the ice was in a solid pack three to four feet thick, and we were struggling along on the edge of it looking for a lead, and working to the westward in so doing. To the northeast the ice was also in a firm pack, with icebergs and hummocks close enough

together to prevent the opening of the ice to any extent. At noon I established the position of the boat in latitude 75° 48′ north, longitude 66° 50′ west.

In the afternoon the southeast gale had caused a fearful sea, and working as we were on the edge of the ice-pack, our situation became one of great danger. The wind had started the Melville Bay pack out from the land to the northward and westward, making a regular bight, in which we were fairly placed. We had to carry sail in order to keep the boat under control. Steam would have been of no use, since the little Juniata could not for one moment have steamed against such a gale. Lying to was not to be thought of, lest we should drift to the pack and be ground to pieces. The prospect at this time was a terrible one. Icebergs near us, 100 feet in height, had the spray from the sea thrown over their tops. On approaching the edge of the pack-ice, we could see a scene of great confusion. The bordering ice would be broken in large pieces and hurled upon the more solid ice, only to be displaced by fresh pieces torn adrift by the gale and rolled over and over upon the face of the pack. The fate of the boat and the party appeared certain. We were half buried in the seas at times, shipping quantities of water and deluging everything in the boat. It rained in torrents. Had our sail split or our mast gone, nothing could have been done. Providentially everything held, and we were enabled to keep the boat under some control. The fog was very thick, making it extremely difficult to see the ice-pack each time, until we were fairly alongside of it, in which case we had to wear ship at once without delay, not knowing in so doing whether we could clear this grinding and crushing mass of ice or not.

This state of affairs continued until 10 o'clock on the morning of Saturday, August 9, at which time there came a lull. We had then been in this heavy gale thirty hours, and were in a very cold and exhausted state. Everything was completely saturated with water, and we had so much water in the boat that I feared she had sprung aleak. The Little Juniata behaved wonderfully well, and did more than such a small craft could have been expected to do. With our fire-room flooring covered with water, the coal-bunkers half full of the same, every locker in the boat afloat, all our baling would have made no impression on this bulk of water, which was constantly increased by the seas shipped at every one of the fearful plunges of the boat and the showers of spray thrown over us.

We hailed with great relief this lull in the wind which gave promise of a breaking up of the gale, and fearing for the safety of the boat, should the wind subside, leaving this fearful sea running, we attempted to get fire lighted under the boiler. This was no easy matter, and for a while seemed impossible. The matches we had taken with us were wet and useless. The tinder was likewise saturated and of no avail. After several hours' work we succeeded in getting a friction-match dry enough to ignite, Ensign May having warmed and dried it by keeping it next his body for that purpose, and with this match we lighted a candle in a lantern, which was almost immediately extinguished by a gust of wind. By a repetition of the same process, Mr. May secured another lighted match, and this time we succeeded in keeping our candle alight. We attempted then to build a fire, but every stick of wood was soaking wet. By taking cotton waste and junk, wet as they were, and pouring oil plentifully over them, we succeeded at last in lighting our fire.

During this time the wind had moderated and hauled to the southwest. I calculated the boat to have been in latitude 75° 48′ north, longitude 68° 30′ west, on the port tack, (wind at southeast true,) and longitude 67° 10′ west on the end of each starboard tack. We had been running on a line nearly east and west during the gale, making about twenty-five miles on each tack before wearing ship, and obliged to go over nearly the same ground on account of icebergs, luffing to the wind as occasion served or required.

At this point I was forced to the conclusion that prosecuting the search any longer was out of the question. My orders read positively to return when the fuel was half expended, and on no account to risk the boat in the ice-pack. The fuel was half gone, and what was left was in such a condition as to lead to very grave doubts as to its being reliable for steaming on the return. As far as we could see to the northward and eastward was pack-ice, and it was in this direction that our port lay. I did not know how close to the middle pack we had been blown during the gale, and I feared if the wind came out in the northwest, we would not only be blown down upon the Mellville Bay pack, but be followed by detached portions of the middle pack and caught firmly between the two. Again, if we had succeeded in working our way through a lead in toward the land, and had reached it, we had not fuel enough to work our way back through the pack-ice, supposing that a northwest wind had not closed us in for the year.

Up to this time we had seen nothing of the Polaris or of her people Had they been at Cape York, it would not have added to their chances of safety had our little party increased their number, with the ice effectually closing our means of exit. Anxious as we were to find them, and tell them of relief coming, I could not further risk our party being caught in the ice in an open boat, with the season closing, new ice forming, and only fuel enough to keep us warm for a few days. I did not know how far the United States steamer Tigress was behind us, nor what our chances would have been of her rescuing us had we been frozen in. The weather was uncertain, another gale like our previous one was by no means unlikely, and my orders expressly forbade me to jeopardize the lives of the party by putting the boat in the pack-ice.

Reluctantly, therefore, I was compelled to announce that the search must be given up, and headed the boat to the southeast on our return, having steam enough to go ahead at 4 p. m. Having gone up on the in-shore track, I concluded to return by the off-shore or mid-channel track, in hopes that we might see something of the Polaris or her people, but in this we were not gratified.

The wind continued hauling to the westward, soon reducing the southeast swell, and creating a swell from the northwest. Before this we went along at a good rate, the weather clearing gradually, the ice-pack disappearing astern.

Sunday, August 10, opened clear and pleasant; so continuing till past meridian. For the first time since leaving the ship I succeeded in getting observations, and established the boat's position at noon in latitude 74° 45′ north, longitude 59° 37′ west, having run nearly one hundred and fifty miles during the preceding twenty-four hours.

At 1 p. m. sighted the Devil's Thumb, bearing true northeast by north, distant about sixty miles, verifying our position at noon with tolerable accuracy. The weather here became cloudy and squally from west-southwest, with snow, hail, and rain. Wind shifting again at 4 o'clock to southwest, with moderate sea, and so continuing till 9 p. m., from which time to midnight we had light, variable airs.

Monday, August 11, opened clear and pleasant, with freshening breezes from northeast. At 4 a. m. sighted land on port bow, which I recognized as Cape Shackelton, and at 5.30 a. m. sighted the Duck Islands on port beam. This day and the day previous we had considerable trouble with our fires. Knowing that we were short of fuel we economized as much as possible, and were sometimes rewarded by the engine stopping itself for want of steam.

At noon got our latitude by meridian altitude of the sun to be 73° 38′ north, or on the parallel of the Horse's Head, which now showed itself on our port beam. We then headed in for Brown Island, off Tessuisak, favored with a fine breeze from north-northwest with long swell, which led me to think that the weather had been unsettled after our departure from Cape York. At midnight we were inside of Brown Island, heading in for Tessuisak.

At 1 a. m., Tuesday, August 12, sighted Jensen's house, and discovered a steamer, apparently at anchor, in the harbor. She immediately thereafter steamed out toward us, and coming alongside of us proved to be the United States steamer Tigress, Commander James A. Greer, from Upernavik the previous evening. I boarded her, and communicated to Commander Greer the result of our reconnaissance, imparting to him the circumstances of wind, weather, ice, and other details relating to his coming journey, up to 4 o'clock on the afternoon of Saturday, August 9, at which time we left the neighborhood of Cape York. I exhibited to him my chart, showing our track going and returning; reported to him the prevalence of pack and new ice in Allison Bay, and respectfully recommended him to strike to the northwest from Cape Shackelton, instead of looking for the Devil's Thumb.

I also offered him the services of our entire party and boat, expressing our willingness and readiness to accompany him to the northward in his search for the Polaris, which services, to our great regret, he declined. Receiving from him his mail and dispatches for you, I left the Tigress at 2 a. m., she immediately steaming to the westward to round Brown Island, and the Little Juniata steered in for her anchorage in front of Jensen's house.

The people of the Tigress were all well, in good spirits, and enthusiastic as to their success, which we heartily wished them in spite of our disappointment.

At 8.40 a. m., having received on board the six hundred pounds of coal left with Jensen on the 2d, and having received from him some seal blubber, in case we ran out of coal, we got our anchor and steamed away, passing among the same islands, and through the same channels, as in going north, and, favored with fine weather and smooth sea, reached the ship without any mishap at 8 p. m. to-day, and were warmly received and welcomed back by you and the other officers assembled at the gangway.

It now remains for me to hope, in submitting this report to your consideration, that my conduct in the affair will meet with your approbation, and that though we were unsuccessful in the endeavor to find the Polaris or her people, no means were left untried that the nature of the difficulties met with and the limited ability of our boat would allow. I believe the Little Juniata to have accomplished more than was expected of her in reaching the parallel of 75° 52′ north, there successfully working through a gale of great violence, and running nearly seven hundred miles while away from the ship. With the limited chances for keeping a reckoning, owing to the thick, foggy weather,

and the constant discomfort of being in wet clothing, with every article in the boat drenched by the rains or by the waves breaking over her, I fear that this report will not prove as satisfactory for navigation purposes hereafter as would be desired.

I have made this report to you in detail, omitting no circumstance, however slight, that a fair general idea might be obtained of the circumstances of Arctic navigation in an open boat, even at this the most favorable season of the year.

From our experience I have no hesitation in saying that pack-ice is to be experienced from Allison Bay in-shore to Cape York, and for some miles to the westward of that place; that its location with reference to the shore is dependent on the winds, which are at best uncertain; that a lead in the pack with one wind may as surely be a trap in which a boat can be caught in another wind; that at this season even, new ice an inch in thickness will form in a single night, as per our experience in Allison Bay on August 4; that even the edges of the pack-ice were three feet and more in thickness, making it extremely difficult, if not impossible, for a powerful steamer to work her way through in safety; that a gale of wind in this region is always attended with danger if in the neighborhood of pack-ice. It may be that we are giving no new information on this subject, but our experience may be of service to some future expedition in which a reconnaissance may be made in boats.

I have to commend to you in the most favorable terms, Lieutenant Chipp, Ensign May, and Mr. Dodge. To the coolness and good judgment of Lieutenant Chipp I am indebted for much assistance in carrying on the work of the expedition, and for the zeal manifested in circumstances of great personal discomfort and in the face of dangerous difficulties, he could not have been excelled. Ensign May also performed his duty with ability and zeal, untiring in his work to the end. Of Mr. Dodge and his valuable assistance I have before spoken, and it gives me great pleasure to certify to his practical knowledge of the ice and its location, and the best ways of avoiding it, as well as to the cheerfulness and readiness with which he bore his part of the labors of handling the boat, tending fires, steering, &c., as well as going without rest repeatedly when our proximity to the ice made it necessary for me to have him on deck at all times, to profit by his information and previous experience.

I have to call to your favorable notice Frank Hamilton, machinist, Richard Street, boatswain's mate, Martin T. Maher, ordinary seaman, and William King, ordinary seaman, engineer's force, all of whom volunteered for the expedition, and who performed their duties well, being animated by the same zeal as the officers in reaching Cape York, as long as there was a chance of our being of service to the Polaris or her people. And I respectfully request that you will make such mention of these men to the honorable Secretary of the Navy as their voluntary services in a hazardous expedition may seem, in your judgment, to have entitled them.

Throughout this trip the officers and men worked alike and fared alike, and as we are unanimous in our regret that as far as finding and relieving the Polaris was concerned we failed, we beg to assure you we are of one voice in volunteering for any subsequent expedition from this ship or from the United States, in which our efforts can be made useful, or our experience in the Little Juniata of any effect.

I cannot close this report without commenting upon the great interest taken in the matter by yourself, the provision made for our comfort, and

your thoughtful care that nothing should be wanting to insure our safety and the success of the expedition.

I have the honor to be, captain, very respectfully, your obedient servant,

GEORGE W. DE LONG,
Lieutenant U. S. N., late Commander Little Juniata.

Commander D. L. BRAINE, U. S. N.,
Commanding United States Steamer Juniata.

No. 37.] UNITED STATES STEAMER JUNIATA, (3d rate,)
Godhavn, Disco Island, Greenland, August 18, 1873.

SIR: I have the honor to inclose herewith, for the information of the Navy Department, a copy of a communication received by me from Commander James A. Greer, United States Navy, commanding United States steamer Tigress, and which contains the latest intelligence of that vessel since her sailing from Upernavik for the northward. The original of this was sent via Iviktout, Greenland.

I am, sir, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., commanding U. S. Steamer Juniata, and Senior Officer Present.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

TIGRESS, OFF TESSUISAK, *August* 12—10 m.

We have just arrived, my dear Braine, and I send this by the pilot. Please send the inclosed to the United States by the first good opportunity. If you desire to see icebergs, take a run up as far as Kingitoke and your curiosity will be satisfied. I had my first bump to-day; could not be helped, as it was a choice between rocks and bergs. No damage done; sensation novel. Hear nothing of De Long.

Yours, very truly,

JAMES A. GREER.

Commander BRAINE,
Commanding United States Steamer Juniata,
Upernavik Greenland.

My confounded engine got on center again; ran easily on a smooth rock; backed off with no damage. Governor Jenson is going to pilot us clear of the island. I have just met De Long on his way back; I send this by him at 1.30 m. All well.

Yours, &c.,

JAS. A. GREER.

UNITED STATES STEAMER JUNIATA, (3d rate,)
Harbor of Saint John's, Newfoundland, September 13, 1873.

SIR: I have the honor to report the arrival at this place of the United States steamer Juniata, under my command, ten days from Godhavn, Island of Disco, Greenland:

August 31, at 9.30 a. m., I sailed from Godhavn, taking a course down the middle of Davis Strait, passed Cape Walsingham and Cum-

berland Sound, Frobisher's and Hudson's Straits, crossing the track of whalers on their return. Most of the passage from Godhavn here was performed under sail alone and in very stormy weather, and here I would beg leave to state that from August 10, at Upernavik, at which date we had our first snow, until our departure from the Greenland coast, the weather was boisterous, with heavy gales, with ice, hail, and snow, the latter falling 10 to 18 inches of a night, with all the indications, as stated by the residents of Godhavn, of an early and unusually severe winter.

I beg leave to refer to my letter No. 36, under date of August 16, 1873, wherein I informed the Department of my intent, under your instructions, to wait at Godhavn for the United States steamers Tigress and Polaris.

I had sent to the Waigatt mines our steam-launch, Ensign J. D. Keeler in charge, with the intent of getting coal for this ship, the Tigress, and Polaris; when, August 25, at 3 a. m., the Tigress arrived at Godhavn, having been, between August 11 and 25, to Littleton Island, (latitude 78° 25′ north, longitude 73° 46′ west,) and found (Commander Greer reports) the camp of the Polaris, near said island, upon the main land; for particulars of which I refer you to Commander Greer's report, which I herewith inclose; also copies of telegrams sent from here.

About meridian, August 25, the Tigress, having in the meantime been coaled by me, sailed to make further search along the Labrador coast for the officers and crew, whom she had not as yet rescued.

Before sailing, Commander Greer was informed by me that at Iviktout, Greenland, about latitude 61° north, arrangements had been made by which he could obtain a supply of coal, (he was furnished with a chart of that harbor,) and I advised him to take advantage of it, for, with that coal, he could continue his search to the northward and westward. When he left Godhavn, Disco Island, he had coal for twenty-eight days' full steaming, and if he were to use it continuously his supply should not be exhausted until September 22. Before Commander Greer, in the Tigress, left Godhavn, Island of Disco, on the 25th of August, I suggested to him that he had better return to Godhavn and again meet the Juniata; he informed that he did not intend to return to Godhavn; did not need the services of the Juniata any more; did not desire me to remain there any longer with the view to assist him in any way, and that he intended to proceed to Saint John's, Newfoundland, after his search was concluded to the west side of Baffin's Bay and Davis Straits.

After the Tigress sailed I waited at Godhavn nearly six days, in the meantime recalling the officers and men who were at the coal mine.

The Department's telegraph dispatch (in response to the one sent by me of the Polaris, as reported by the Tigress) was received September 11.

I am coaling with dispatch, and in a day or two will complete the required repairs to the engines and boilers of this vessel, and shall sail in search of the crew of the Polaris, in obedience to the Department order "to continue the search."

I am happy to state that the health of the officers and crew of this vessel is excellent.

I am, sir, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., commanding U. S. Steamer Juniata,
and Senior Officer Present.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

[Telegram.]

SAINT JOHN'S, NEWFOUNDLAND, *September* 10, 1873.

HON. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C., United States.

Juniata arrived to-day; met Tigress at Upernavik; coaled her. She sailed August 11 for Littleton Island. Tigress met Juniata steam-launch, Lieutenant De Long, off Tessuisak, who had been to Cape York in launch and returned. At Disco met Tigress again; again coaled her. August 25, Commander Greer reports: "Camp of Polaris found August 14 off Littleton Island, (latitude 78° 23′ north, longitude 73° 46′ west;) crew of Polaris all well; had gone south two months before in two whale boats made of ship. Polaris sank one month after. Kept careful lookout, going north and coming south; no signs. Stopped at all settlements; no news. Crew of Polaris probably on board of whaler from Cape York. Tigress left Disco August 25 for Labrador coast, to continue search as long as coal and season permit."

D. L. BRAINE,
Commander United States Navy.

[Telegram sent from Saint John's, Newfoundland, September 11, 1873.]

Commodore WILLIAM REYNOLDS, U. S. N.,
Acting Secretary Navy, Washington City, United States.

"Dispatch received; will coal and sail immediately; should I meet Tigress will instruct her continue search of Polaris crew, still missing."

D. L. BRAINE,
Commander United States Navy.

[Telegram from St. John's, N. F.]

GEORGE M. ROBESON,
Secretary Navy, Washington:

Juniata not fit or fortified sufficiently to proceed north at this late season. Captain Braine bound to sail at once. At the recommendation of experienced sealing masters of this port, would advise not to proceed. Five steamers now whaling north, and looking for them. Orders to come home after 5th September, fearing chance of being frozen up.

THOS. N. MOLLOY,
United States Consul.

[Telegram.]

NAVY DEPARTMENT,
Washington, September 13, 1873

Consul MOLLOY, *St. John's, N. F.:*

Telegram received. The Department hopes Juniata has gone north in compliance with her orders.

WM. REYNOLDS,
Acting Secretary of the Navy.

[Telegram.]

NAVY DEPARTMENT, *September* 10, 1873.

Commander D. L. BRAINE,
Commanding United States Steamer Juniata, St. John's, N. F.:

Dispatch received. Continue to search for crew of Polaris.

WM. REYNOLDS,
Acting Secretary Navy.

[Telegram.]

Commodore WM. REYNOLDS,
Acting Secretary Navy, Washington City, U. S.:

Dispatch received. Will coal and sail immediately. Should I meet Tigress, will instruct her continue search if Polaris crew still missing.

D. L. BRAINE,
Commander United States Navy.

ST. JOHN'S, N. F.

[Telegram.]

GEO. M. ROBESON,
Secretary Navy, Washington, U. S.:

Yesterday started north to search as ordered. Midnight overhauled by steamer Safety. Polaris crew rescued by English steamer Arctic. Telegraphed from Dundee, Scotland; reported by American Consul Molloy to me. Returned to port this day.

D. L. BRAINE,
Commander United States Navy.

ST. JOHN'S, *September* 19, 1873.

[Telegram.]

NAVY DEPARTMENT,
Washington, September 19, 1873.

United States Consul MOLLOY,
St. John's, Newfoundland:

Dispatches of yesterday and to-day received. Thanks for your attention.

WM. REYNOLDS,
Acting Secretary of the Navy.

[Telegram.]

ROBESON,
Secretary Navy, Washington, U. S.:

Steamer Hector, whaler, arrived from Uiantihek Harbor, Cumberland Inlet. Sailed thence September 17. Tigress left above place 16th, going to Poiktout, Greenland, for coal, thence to track of homeward-bound whalers. Greer told Captain Hector, if he did not get information of Polaris or people, will be at St. John's about middle of October.

D. L. BRAINE,
Commander United States Navy.

ST. JOHN'S, *September* 25.

[Telegram.]

SECRETARY NAVY, *Washington, D. C.:*

Whaling steamer Hector arrived. Report Tigress at Uiantihek, Cumberland Sound. All well 15th September. Will cruise to end of October to intercept Scotch whalers.

MOLLOY,
United States Consul.

DEPARTMENT OF STATE,
Washington, September 19, 1873.

SIR: A telegram has just been received from Mr. William Reed, vice-consul of the United States at Dundee, Scotland, stating that the "Polaris expedition arrived here destitute. Crew saved, awaiting orders; telegraph." There being no fund at the disposal of this Department from which the wants of these seamen can be relieved, I have the honor to request you to advise me of the action to be taken in the matter.

I have the honor to be, sir, your obedient servant,

J. C. B. DAVIS,
Acting Secretary.

Hon. GEORGE M. ROBESON,
Secretary of the Navy.

NAVY DEPARTMENT, *September* 19, 1873.

SIR: I have the honor to acknowledge the receipt of your letter of this date, in relation to the arrival of the crew of the Polaris at Dundee.

The Department would be glad if you will telegraph at its expense to the United States consul at Dundee to make proper provision for the comfort of the people of the Polaris and send them to the United States by the first steamer, and draw on this Department for the amount expended on this account.

Very respectfully,

WM. REYNOLDS,
Acting Secretary of the Navy.

Hon. J. C. B. DAVIS,
Acting Secretary of State.

DEPARTMENT OF STATE,
Washington, September 19, 1873.

SIR: Upon the receipt of your letter of this date respecting the arrival of the crew of the Polaris at Dundee, I telegraphed to the vice-consul there as follows: "Provide for the people of the Polaris and send them to the United States by first steamer. Draw on Secretary of Navy for expenses."

Since that telegram was sent the following has been received from General Badeau, consul-general at London, which I communicate for your information, viz:

Polaris expedition arrived at Dundee. Buddington and scientific men want money. Shall it be supplied?

I have the honor to be, sir, your obedient servant,

J. C. B. DAVIS,
Acting Secretary.

Commodore WILLIAM REYNOLDS,
Acting Secretary of the Navy.

NAVY DEPARTMENT, *September* 20, 1873.

SIR: I have the honor to acknowledge the receipt of your letter of the 19th instant, in relation to a telegram from the consul-general at London, respecting the survivors of the Polaris expedition.

I will thank you to authorize the consul to supply the officers with two hundred or three hundred dollars each, and the men from fifty to one hundred dollars apiece, as they may desire, on account of their pay, and draw on the Department for the amount.

Very respectfully,

WM. REYNOLDS,
Acting Secretary of the Navy.

Hon J. C. B. DAVIS,
Acting Secretary of State.

DEPARTMENT OF STATE,
Washington, September 20, 1873.

SIR: I have the honor to acknowledge receipt of your letter of this date respecting advances to be made to the officers and men of the Polaris.

The following telegram has been sent to the consul-general at London:

Supply officers with two or three hundred dollars each, and men from fifty to one hundred dollars each, on account of their pay, and draw on Secretary of Navy, unless consul at Dundee has already done so under instructions of yesterday.

I have the honor to be, sir, your obedient servant,

J. C. B. DAVIS,
Acting Secretary.

Commodore WILLIAM REYNOLDS,
Acting Secretary of the Navy.

[Telegram.]

NAVY DEPARTMENT, *September* 19, 1873.

Commander BRAINE,
Juniata, St. John's, N. F.:

Await at St. John's arrival of Tigress, and then return to New York.

WM. REYNOLDS,
Acting Secretary Navy.

No. 45.] UNITED STATES STEAMER JUNIATA, (3d rate,)
Harbor of St. John's, Newfoundland, September 14, 1873.

SIR: I have the honor to inclose herewith to the Department for your information copies of reports made to me by Ensign J. D. Keeler, and Second Assistant Engineer H. E. Rhoades, attached to this ship, in regard to the coal-mines at Waigatt Strait, Disco Island, Greenland, to which an expedition was sent to obtain coal for this ship.

Very respectfully, your obedient servant,

D. L. BRAINE,
Commander United States Navy,
Commanding U. S. Steamer Juniata, and Senior Officer Present.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES STEAMER JUNIATA, (3d rate,)
Godhavn, Disco Island, August 30, 1873.

SIR: I have the honor to submit the following report of the cruise of the steam-launch Little Juniata, to obtain information respecting the possibility of procuring coal on this island, from the mines in the Waigatt, distant about ninety miles from this place, and to mine coal for this ship, if possible.

In obedience to orders received from yourself, I took charge of the steam-launch Little Juniata, having on board the following officers: second assistant engineer, H. E. Rhoades; gunner, M. K. Henderson; captain's clerk, G. J. Marbury; pilot, H. W. Dodge; and twelve men, with mining implements and provisions for fifteen days; and at 6.15 p. m. on the 23d of August I left this vessel, having in tow the Danish sloop Three Sisters, with the intention of bringing her back loaded with coal, provided we could mine successfully, and if she was not detained by the Danish authorities at Rittenbenk. I arrived at that place at 3 a. m., August 25, and at 5.30 a. m. went on shore and communicated with the governor of the place. I found that the sloop would be delayed for some hours, as she had cargo to discharge, and therefore made arrangements with the governor to have the sloop follow me as soon as her cargo was landed, and at 11.45 a. m. of the same I got under way and stood for the settlement Njaiasusak, having in tow a small schooner, with eleven Esquimaux on board, whom I had engaged to assist me in mining, and one of whom, the governor assured me, knew the location of the mine. I left a quantity of provisions in the sloop, with Mr. Marbury in charge. As we were leaving the harbor, we met a sloop from Egedisminde, and upon hailing her was informed by her captain that he had orders to report to the governor of Rittenbenk for our use in transporting coal.

At 8 p. m. we arrived off Njaiasusak, came to anchor, and communicated with the trader of the station, from whom I learned that we could procure more Esquimaux help from his station if we should need it.

There being indications of bad weather, upon learning that there was no harbor near the mine, I set an anchor-watch, and arranged for the remainder of the crew to sleep on shore. The next day, at 10.25 a. m., I got under way and started for the mines. Owing to our inability to speak the Esquimaux language, we were unable to communicate freely with our pilot, who, it afterward appeared, had been misled by depending upon the assumed knowledge of some of the natives, hunters at Njaiasusak.

At 3 p. m., by the advice of the pilot, we came to anchor about sixteen miles above Njaiasusak, and accompanied by second assistant engineer, H. E. Rhoades, and the pilot, I went on shore, but we failed to find indications of coal in any quantity. I then asked the pilot if he knew the place where the Three Sisters had taken her last cargo of coal. He answered affirmatively, and I then ordered him to take me to that place, which he did, and at 6.15 p. m., August 26, we came to anchor about six miles above Njaiasusak. Accompanied by Mr. Rhoades, I went on shore again and found several veins of coal that had been partially opened by the natives. The inspection proving satisfactory, I immediately landed implements, provisions, and men, and organized camp. The vein in which we decided to commence mining is quite near the beach, and about one hundred feet above the level. I afterward opened another vein, also near the beach, as I found that by so doing I could work my men to better advantage. We commenced

work at 5.30 a. m., August 27, and having removed sand and rubbish, at 7 a. m. commenced taking out coal. After having worked nine hours I found that we had taken out and placed upon the beach, ready for embarking, fifteen tons of coal. The force employed was eleven men (two of them natives) mining, and nine Esquimaux (men and women) engaged in bagging the coal and carrying it to the beach.

Owing to the slowness or incapacity of the captain of the sloop, she had not yet arrived at the mines, and I was therefore obliged to content myself with having the coal already for shipment.

The implements which we employed in mining were picks, shovels, and chisel-bars, and I found them fully efficient for the work. At 8.40 a. m., August 28, I received orders from yourself, per kayak, to return to this vessel with all dispatch. I immediately struck my camp and embarked men and implements in the steam-launch, carrying only sufficient provisions to enable me to reach the ship, and embarking all the coal I possibly could, amounting to thirty-eight bags, fourteen of which remained in the launch when we reached the ship. The remainder of my provisions I embarked in the schooner and sent to Rittenbenk, consigning them to the care of the governor of that place, and made all haste to reach this place, where we arrived at 12 meridian, August 29, having been absent from the ship five days and eighteen hours. The veins of coal which we worked were of from 15 to 30 inches in thickness, and I noticed that the coal became of better quality as we worked into the hill. I believe that a force of one hundred men could easily mine and embark fifty tons of coal per day in ordinary weather, for I think that, except in gales of wind, the surf is never so heavy as to prevent ship's boats from landing and carrying off loads; if necessary, a small wharf could be easily constructed, as there is plenty of stone near by. In case of heavy weather, a vessel using steam-power could easily find a lee from wind of any direction. The harbor of Rittenbenk is only forty miles from the mine, bearing about E.S.E., (true) the land on the N.E. side of the Waigat is very high and would afford a protection against N.E. winds, even at a long distance from the shore; the width of the Waigatt at this point is about twenty-five miles. Flakkenbenk, the S.E. point of Disco Island, forms a protection against winds from N.W., and Rittenbenk harbor is perfectly protected from S.E. gales.

I noticed a constant current to the northward and westward setting through the strait, and found the whole of the Waigat, as far as I could observe, entirely clear of pack and floe-ice, although icebergs were quite numerous.

Native help may be easily obtained, and at reasonable rates, the usual price being one-half of a Danish dollar (about 28 cents,) per day, and rations.

The only shelter we had or needed at the mines were the canvas tents we took from this ship, and all enjoyed the most perfect health. In conclusion, I have the honor to express it as my opinion that coal can be procured at the Waigat mines in sufficient quantities, and with reasonable outlay of time and labor.

I am, sir, very respectfully, your obedient servant,

JOHN D. KEELER,
Ensign United States Navy.

Commander D. L. BRAINE, U. S. N.,
Commanding United States Steamer Juniata, (3d rate,)
Godhavn, Disco Island, Greenland.

UNITED STATES STEAMER JUNIATA, (3d rate,)
Godhavn, Disco Island, Greenland, August 30, 1873.

SIR: I have the honor to submit the following report of my observations of the coal recently mined by the expedition sent by you in the steam-launch Little Juniata to the coal-mines, on the north side of this Island, and about ninety miles distant from this place.

At 6.15 p. m. of the 26th instant we arrived at the coal mine about six miles beyond Njaiasusak, a small settlement or hunting station. Ensign J. D. Keeler, who was in command of the expedition, and myself went on shore to prospect, and found three veins of coal that had been barely opened by the Esquimaux. The best vein of the three was about 2½ feet in thickness, running longitudinally through the mountain, only a few feet back from the beach, and about 100 feet above the level.

On top of this vein of coal were three strata, viz: one stratum of sand about 6 feet thick, another of black plate clay about 3 feet thick, and another of sand about 6 feet in thickness. The latter was immediately on top of the coal, very hard and occupied at least one-third of our time in removing it from the coal.

At 7 a. m. of 27th we commenced work, and in nine hours took out about fifteen tons of coal, and piled it on the beach, ready for embarkation in the sloop as soon as it arrived. The tools we used, which proved efficient and sufficient, were a dozen common pick-axes, a half dozen chisel-bars, and a dozen shovels, using the latter only for removing the sand. The mining was done by nine of our men and two Esquimaux, and the coal carried in bags, made of hide, by nine other Esquimaux to the beach. In the afternoon we divided our party into two separate gangs, and worked upon two separate veins, both veins being near at hand.

Next morning we found that the strata overlaying the coal had broken away and slid down, filling up our working ledge, which sand had to be removed before we could continue work. This was done after a half-hours' labor, and we resumed work upon the vein. As we advanced into the vein I noticed that the coal gradually assumed a blacker and brighter hue, indicating the presence of bitumen, and some lumps were sprinkled with small particles of resin. The vein was also growing thicker, being at this time over 3 feet in thickness. Up to this time we had only gone about 4 feet into the vein longitudinally.

At 8.45 a. m. of the 28th instant, Ensign Keeler received orders from you, brought by two kayaks from Godhavn, for the expedition to return to Godhavn as soon as possible, as you only awaited our arrival to depart from that place. The sloop had not arrived up to this time, and we had no means for transporting the coal which we had mined to Godhavn, consequently we were obliged to leave all that would not go into the launch on the beach. This we were very loth to do, but there was no help for it. After depositing our tents, implements, &c., into the launch, we found we had only room for about two tons of coal, which we brought with us. Our twelve men, six officers, and two Esquimaux, in addition to the other things, sunk the launch pretty deep. Our water-tanks, with the exception of two compartments holding about forty gallons of water, were converted into coal-bunkers, consequently we were obliged to use salt-water for our boilers, which necessitated frequent blowing to get rid of the saline matter left behind, after the steam had been generated from the water.

The expenditure of fuel to heat the double quantity of water used, which stood at a temperature of 42° F, was necessarily greater than it

would have been had we used fresh-water, which this boiler was built for the use of.

We made the run from the mines to the ship, a distance of ninety miles, in exactly fifteen hours, burning about one and a quarter tons of coal, during which time we kept up a regular pressure of steam of twenty pounds to the square inch, with the furnace door open a part of the time, and at no time allowed the saturation to go above $\frac{2}{32}$. We were unable to perform any careful experiments of the coal on the trip, but the following observations of its steaming qualities, made by me, I most respectfully submit to you.

The coal, when taken out of the mine, was chiefly in lumps, but it is so friable in its structure that about half of it broke into small particles while transporting it to the launch from the mine. It is comparatively easy to ignite, it burns freely, and forms very little clinker, and I found that the small particles burned nearly as well as the lumps. By weight, I should judge that it required about one-fourth more of this coal consumed in any given time to produce a mechanical effect equal to the best Welsh coal. It is bituminous in its nature, it produces very little smoke, of a brownish color, and requires very little labor in stoking; and the best results are obtained from a thick and level fire.

During our leisure time at the mines we prospected the immediate vicinity and found other veins, which indicated good coal and quantities of it. The coal is so easily mined that our force of twenty-one people could have removed and carried to the beach at least one hundred tons of coal within five days, with the tools which we used.

I am, sir, very respectfully, your obedient servant,

HENRY E. RHODES,
Second Assistant Engineer, U. S. N.

UNITED STATES STEAMER JUNIATA, (3d rate,)
Harbor of St. John's, Newfoundland, September 28, 1873.

SIR: I have the honor to inclose herewith, for the information of the Department, a copy of my orders, given to Commander James A. Greer, commanding the United States steamer Tigress, at Godhavn, Disco Island, Greenland, on August 25, 1873, as senior officer present, and which I judged are in conformity with the instructions of the honorable Secretary of the Navy, to myself.

I am, sir, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., Commanding U. S. S. Juniata, (3d rate) *and Senior Officer present.*

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES STEAMER JUNIATA,
Godhavn, Disco Island, Greenland, August 25, 1873.

SIR: I am pleased to acknowledge the receipt of your communication of this date, with the satisfactory information that, with the United States steamer Tigress, under your command, you successfully reached Littleton Island, Smith Sound, Arctic region, where you state that you obtained information that the crew of the Polaris passed last winter, and departed to the southward, some time in June, 1873. You also feel

convinced that the officers and crew of the Polaris have been picked up by some of the whalers that this year passed Cape York. You will, therefore, be pleased to carry out the instructions ot the honorable Secretary of the Navy by "renewing your search" on the west side of Davis Straits, until you find the officers and crew of the Polaris, or you gain satisfactory information of them, or you feel satisfied that you have done all in your power to carry out the orders of the Navy Department, from which I quote as follows: "Prosecute your search after parting company with him, (Commander Braine,) according to your own discretion under your orders." Wishing you success,

I am, very respectfully, your obedient servant,

D. L. BRAINE,
Commander, Commanding United States Steamer Juniata, and Senior Officer present.

Commander J. A. GREER,
Commanding United States Steamer Tigress.

P. S.—As you do not desire me to remain here any longer, with the view of assisting you in your search for the officers and crew of the United States steamer Polaris, I will sail from this port for St. John's, Newfoundland, about September 1 or 5, 1873, or as soon as the coaling party have retured from the coal-mine.

D. L. BRAINE,
Commander, United States Navy.

NAVY DEPARTMENT, *October* 9, 1873.

SIR: The Department has received your letter of the 28th ultimo, No. 50, and the copy therewith inclosed of the orders given by you to Commander J. A. Greer, commanding the United States steamer Tigress, in conformity with the instructions of the Department.

Very respectfully,

GEO. M. ROBESON,
Secretary of the Navy.

Commander D. L. BRAINE, U. S. N.,
Commanding United States Steamer Juniata.

UNITED STATES STEAMER JUNIATA, (3d rate,)
St. John's, Newfoundland, October 16, 1873.

SIR: I have the honor to report that the United States steamer Tigress, under the command of Commander James A. Greer, arrived in this port this afternoon, at 3 o'clock.

Agreeably with the telegraphic instructions I have received from the Navy Department, I have remained with this vessel under my command at this port until the arrival of the Tigress, and now, in accordance with the Department's orders, propose to sail with this vessel under my command for New York about the 20th instant, weather permitting.

I am, sir, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., Commanding Juniata, Senior Officer present.

Hon. GEO. M. ROBESON,
Secretary of the Navy, Washington, D. C.

[Telegram.]

NAVY DEPARTMENT, *October* 17, 1873.

Proceed to New York with Juniata.

GEO. M. ROBESON,
Secretary of Navy.

Commander BRAINE,
Care of United States Consul, St. John's, Newfoundland.

CONSULATE OF THE UNITED STATES OF AMERICA,
Dundee, October 22, 1873.

SIR: The Ravenscraig steamer, which picked up the fourteen men of the United States steamer Polaris off Cape York, arrived here on Saturday with the rough boat which the men had made during last winter, and by which they escaped from the ice. In the name of the United States, I claimed said boat as the property of the Navy Department, being in my opinion valuable as a relic of the north polar expedition. The captain denied my claim thereto, and stated (what I was not then aware of) that he was presented with the boat by Captain Buddington, Chester, and each and all of the men of the Polaris, and that it was now his property.

However, the owner of the Ravenscraig, Ninian Lockhart, esq., of Kirkcaldy, and the captain, very graciously (while repudiating the Navy Department's right to the boat) made a free gift of it to the Smithsonian Institution at Washington, and it will, I understand, be sent there along with the three men of the Polaris, (Bryan, Mauch, and Booth,) who arrived at this consulate to-day in the Erick whaler.

I telegraphed you this afternoon that these three men had safely arrived, and would be forwarded to New York by the Georgia steamship, of the State Line Steamship Company, sailing from Glasgow on Friday, 1st.

Let me repeat that this company deserves thanks for their attention, and repeated offers to convey the Polaris crew to New York. The moment they heard of the arrival of Bryan, Booth, and Mauch they telegraphed me that the Georgia was at their service, and I accepted their generous offer to convey these men (along with the boat referred to) in the saloon of their steamer to New York free of charge. They will proba bly reach New York on Wednesday week, 5th or 6th November. All of them are in good health, and I have supplied them with clothing and money, same as I did to the others.

Captain Allen and the surgeon, Dr. Souttar, of the Ravenscraig steamship, who picked up the fourteen men, have personally sustained heavy expenses in providing from their own wardrobes clothing to all the men. On investigation I find that Captain Allen gave clothing to Captain Buddington, Mr. Chester, and other men, to the value of ten pounds sterling, while the surgeon, Dr. Souttar, distributed a great number of articles of his own clothing to Dr. Bessels and others, which would exceed six pounds in value. You may have some idea of the amount of clothing so furnished, when I mention that, when picked up, the fourteen men of the Polaris were, many of them, pretty much clothed with bear-skins, seal-skins, and other like articles. I would, therefore, recommend that, in addition to the thanks of the Navy Department being conveyed to Captain Allen and his crew for the rescue of the

Polaris people, as well as Dr. Souttar, for his kindness, they should be re-imbursed for their personal outlays of clothing by the Government. I wished these two gentlemen (Captain Allen and Dr. Souttar) to state to me what claims they had, but they declined to do so, saying that they would rather prefer the Department itself to recognize their efforts in whatever way the Department thought proper. They mentioned to me, however, that by receiving the men, and having them on board, they missed the opportunity of catching whales, (by which their wages are regulated,) and only returned to Dundee with one fish.

Mr. Lockhart, the owner of the Ravenscraig, has, in answer to my request to be furnished with his claim for the board of the fourteen seamen of the Polaris, from 23d June last, (when they were picked up,) just waited upon me. He says that he cannot properly estimate what remuneration he is entitled to therefor, as he gave the men the free use of everything on board, which they availed themselves of.

Like Captain Allen and Surgeon Souttar, he prefers, he says, to leave his remuneration entirely in the hands of the Navy Department, feeling satisfied that the Government of the United States will not fail to recompense him for the loss he has sustained in his vessel returning home with only one fish, caused, he alleges, by receiving the Polaris's men, and having them on board, and providing for their wants, and getting them sent to Dundee.

It is not my duty to offer any suggestions to the Department as to the course to be pursued; but, as Her Britannic Majesty's government and the British press and people are anxiously watching what remuneration or recognition will be made by the United States Navy to the owners, captain, surgeon, and crew of the Ravenscraig, for their various kindnesses to the Polaris crew, and for rescuing them, I am sure that Congress, on the recommendation of your Department, will not fail to generously consider their claims, and award them ample recompense for their labors and outlays.

I have the honor to remain, your obedient servant,

WILLIAM REID,
United States Vice-Consul.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

No. 72.] UNITED STATES STEAMER JUNIATA, (3d rate.)
Navy-Yard, Brooklyn, N. Y., November 10, 1873.

SIR: Referring to paragraph No. 1093, United States Naval Regulations, authorized by act of Congress May 17, 1864, I have the honor to again call the attention of the Department to the cases of the following-named men, reported by me in my letter No. 36 to the Department, under date of August 16, 1873, as deserving of medals of honor, for extraordinary service rendered as volunteers, in forming the crew of the steam-launch Little Juniata, in her cruise from Upernavik to Cape York, Greenland, and return, and whose names I think the Department may have overlooked.

I would again ask that, if consonant with the views of the honorable Secretary, the medals of honor and the accompanying gratuity, designated by the act of Congress above referred to "under the head of

extraordinary heroism in the line of their profession," may be allowed these men, viz: Richard Street, boatswain's mate; Frank Hamilton, machinist; William King, seaman, extra; and Martin T. Maher, ordinary seaman.

Very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., Commanding U. S. Steamer Juniata.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES STEAMER JUNIATA, (3d rate,)
Off Battery, New York, November 1, 1873.

SIR: I have the honor to make the following report of the cruise of the United States steamer Juniata, under my command, whilst prosecuting the search in the Arctic regions for the United States steamer Polaris, her officers and crew; all under your orders dated June 19, 1873.

The Juniata sailed June 24, from the port of New York, deeply laden with a deck-load of coal and a reduced complement of men. We arrived at St. John's, Newfoundland, June 30, and, after sheathing her bows to meet the ice, and coaling ship to her utmost capacity with a heavy deck-load of coal for the United States steamer Tigress, July 9, 1873, we sailed for the Arctic regions. Amid dense fogs we prosecuted the voyage toward Greenland, having several very narrow escapes from collisions with icebergs.

July 14 we arrived off Fiskernaes, where we met large quantities of ice, and had to pick our way very carefully through it. After several hours' delay off this port, and making the usual signals and failing to obtain a pilot, we stood to the northward along the coast and had several very narrow escapes (owing to fogs) from rocks and icebergs which lined the coast.

July 17 arrived at the port of Sukkertoppen, Greenland, after considerable difficulty. Being unable to procure dogs at this place, in accordance with your instructions, after exchanging official visits with the Danish Governor Larsen, I sailed at 4 a. m. on the 18th for Holsteinborg, at which place I arrived the same day at midnight.

Through the courtesy of Governor Frederick Larsen, with whom I exchanged official civilities, I procured at Holsteinborg eighteen Esquimaux dogs and one hundred and fifty seal-skins for the use of the officers and men of the Tigress.

On July 21 I left Holsteinborg for Godhavn, island of Disco. While at the last-named port I landed about seventy tons of Cardiff coal in bags for the Tigress, also the dogs purchased at Holsteinborg, and in addition twelve others purchased for the same object at this last port. At this part of the Greenland coast, I may state that our cruise became of the most interesting character, having passed a belt of ice off Fiskernaes, also many bergs which had been swept by the current setting around from the east coast of Greenland, and thence north up the west coast.

Our necessitated stay at Godhavn of one week, enabled the officers to prosecute most interesting explorations in regard to Arctic mosses, flowers, and ferns on the mountains hereabout; also to observe an immense number of icebergs in Disco Bay, which had broken off from

the glaciers back of Jacobshaven Fiord, thence passing out of the bay to the westward of the island of Disco, and drifting to the northward with the current, there being over a thousand in sight at one time, and others moving up through Waigatt Strait to the northward of the island of Disco, in connection with those already mentioned, came from Tussukats glaciers to the northward of Prindsen Island.

In conversation with the assistant governor, A. F. Muldriep, who, in the absence of the inspector, S. T. Krarup Smith, was in official charge of Godhavn, and the esteemed lady, the wife of Inspector Smith, of North Greenland, I first learned of the deposits of coal on Disco Island, at Nomsook Peninsula, on Amenak Fjord; but, as my object was to reach Upernavik with all dispatch, I could not at the time make an examination of the coal veins.

July 29, I sailed for Upernavik, and on the passage to that point, where we arrived July 31, we encountered many immense icebergs, whose altitudes were often 200 feet and upward; we had several narrow escapes from them, and on the morning of July 31, whilst pursuing our voyage, owing to the large variation of the compass 85″ westerly and upward and the local deviation together with the inset of the tides in the fiords, the ship was placed in a most perilous situation, we having run into the midst of a group of very high mountainous rocks. The rocks first reported close aboard we barely sheered clear of, only to find others on both bows and beam, and also in the direction in which we had come. After drifting about for half an hour and using our steam we fortunately found an anchorage in 85 fathoms of water, the general depth around us having been 200 fathoms and more. Here we lay close to the rocks, 2,000 feet in height, for several hours until the fog lifted, when we were fortunate again to get to sea; and that afternoon, after winding our way through an innumerable number of bergs, we anchored in the port of Upernavik.

Governor Rudolph and myself exchanged courtesies immediately, and he informed me that a ship of even half the size of the Juniata had never been there, certainly during the period of his official stay, extending over thirty-five years. He warned me of the great danger of remaining there, and recommended me to immediately place the ship in what is called the Danish Harbor, where the Royal Greenland Trading Company's vessels are loaded. I followed his advice and anchored in this harbor, which can more properly be designated as a pocket, and where a vessel is protected from the prevailing gales of that period on that coast, which blow from southwest, true. Here we moored head and stern with our heaviest cables. From this point I dispatched our largest steam-launch, the little Juniata, under command of Lieut. George W. DeLong, United States Navy, who had associated with him (they all being volunteers) the following-named officers and men: Lieut. Charles W. Chipp, Ensign Sidney H. May, Mr. Henry W. Dodge, ice-pilot; Richard Street, boatswain's mate; Frank Hamilton, machinist; William King, seaman extra; and Martin T. Maher, ordinary seaman.

With the Little Juniata most carefully equipped, with sixty days' provisions and fifteen days' coal, August the 2d, she sailed for Cape York, to prosecute the search for the Polaris, her officers and crew. After performing what Governor Rudolph considered one of the most extraordinary voyages on record, along the fast ice, through the innumerable icebergs, pack and hummock ice of Melville Bay, to Cape York, latitude 75° 56′ north, longitude 68° 18′ west, (for full particulars of her cruise, I have the honor to refer you to Lieutenant DeLong's report, a copy of which I forwarded to the Department,) he returned to

the ship at Upernavik, August 12, having met the Tigress off Tessuisak, her commanding officer, Lieutenant DeLong, having imparted to Commander Greer what I considered important information in regard to the open water at that time between Cape York and Tessuisak, no doubt thereby facilitating the voyage of the Tigress to the northward and westward on her search.

Having had several falls of snow between the 2d and 12th of August, and being warned by Governor Rudolph of the peril of a stay here of a ship of the size of the Juniata, ice having also formed in the ponds 200 feet above the level of the sea, and ever since my arrival finding it necessary to stretch hawsers across the harbor to keep out the ice, and having to use our guns with solid shot to break up the small bergs drifting down against the ship, and having delivered to the Tigress the seal-skin clothing, coaled, and dispatched her from this point, the necessity was apparent that I should proceed to my next point of rendezvous with the United States steamer Tigress, viz, Godhavn, island of Disco. Thence I sailed August 13, and having very clear weather arrived at Godhavn August 15, where I expected to await until the last of the season, October 15, 1873, the arrival of the Tigress, or news from her, and from which place I dispatched a kyack seven hundred and fifty miles down the coast to Iriktout, latitude 61° 10′ north, longitude 47° 10′ west, with a request to the authorities there that they would reserve all the coal they could for the use of the Tigress, and at her arrival in which place afterward she obtained 190 tons.

With the expected leisure time before me at Godhavn, I immediately availed myself of the means at my command to prosecute a search for coal, expecting, should the Tigress be successful, that she, and perhaps the Polaris, might need it for their return home. The inspector of North Greenland, S. T. Krarup Smith, being absent at Egedismindie, a distance of seventy miles from this point, I dispatched the whale-boat, in charge of Ensign John D. Keeler, my clerk, G. J. Marbury, and gunner, M. K. Henderson, with a crew of six men, to that place, asking him for the use of any small vessels he might have at his disposal, to bring coal from the mine to the ship at Godhavn. The voyage was successfully made in three days through a gale of wind, and the duty so well performed that I assigned Ensign Keeler to the command of the steam-launch Little Juniata, having associated with him Second Assistant Engineer Henry E. Rhoades, also the officers who had been with the whale-boat, to the coal-mine on the northeast part of Disco Island.

They prosecuted the search successfully, and found several veins of coal running through the mountain longitudinally, the position of the mine being latitude 60° 45′ north, longitude 52° 20′ west.

The mines are a short distance back from the beach, and about 100 feet above the level of the sea. Enclosed please find photograph of a sketch of the same.

On top of these veins of coal were three strata, viz, one stratum of sand, another of black silicate clay, and one of sand, this latter immediately on top of the coal. The coal is easily obtained; the tools used were pickaxes, chisel-bars, and shovels, the mining being done by nine of our men ; the coal carried in bags to the beach. As the mining advanced into the mine, the coal assumed a brighter and blacker hue, indicating the presence of bitumen, and some lumps were sprinkled with small particles of resin, the veins growing thicker as the mining proceeded. The coal proved frail in its structure, not bearing much handling, and was obtained in lumps. It was experimented with for fifteen hours' steaming in the Little Juniata, using salt water. It ignites easily,

burns freely, and forms very little clinkers. The fine coal burns nearly as well as the lump. A regular pressure of steam was kept up 20 pounds to the square inch, with the furnace doors open part of the time, and at no time was the saturation above $\frac{2}{3}\frac{}{2}$. By weight I judge it requires about one-fourth more of this coal to be consumed in any given time to produce a mechanical effort equal to the best Welsh coal. This coal is bituminous in its nature. It produces very little smoke, of a brownish color, and requires but little labor in stoking. The best results as obtained are from a thick and level fire.

While in this locality, several veins were found which indicated good coal and large quantities of it; so easily was the coal mined that our men, nine in number, would have removed and carried to the beach at least 100 tons in eight days with the tools which we used.

I inclose herewith a chart of this and the immediate coal-regions on the west coast of Greenland.

I should here say, in this connection, that the anchorage and holding-ground off the coal-mines worked by us is good, with a depth of from 10 to 20 fathoms, and I deem it perfectly feasible to mine the coals at this point successfully and in large quantities of quality as stated above.

The unexpected arrival of the Tigress at Godhavn, August 25, where I again coaled her, and from whence she sailed the same day to prosecute her search to the westward and northward, caused me to recall the coaling party, though only a small quantity of this coal was brought from the mines, 35 tons of coal being left on the beach for want of means of transportation. I have sixteen bags of this coal, about 150 pounds to the bag, which will be sent to the Washington navy-yard, under the instructions of Engineer-in-chief W. W. W. Wood, Chief of the Bureau of Steam-Engineering, to be tested.

August 31, I sailed for St. John's, Newfoundland, where I arrived September 10, having performed the voyage of over twelve hundred miles almost entirely under sail alone, keeping a careful lookout for whalers in Davis Strait on the way.

On my arrival at St. John's I telegraphed information to the Department of the Tigress finding deserted camp of the Polaris officers and crew at Littleton Island, and that they had started to the southward early in June, 1873, in two whale-boats made of ship.

Here I received telegraphic orders to continue the search for the officers and crew of the Polaris, and after coaling the ship, filling the bunkers and taking a heavy deck-load of coal, I sailed to the northward September 18, in obedience to orders. At midnight of that day, when sixty-five miles to the northward of St. John's, I was overhauled by the English steamer Cabot, the United States consul to St. John's, Mr. T. N. Molloy, on board, who gave me the gratifying information of the safety of the officers and crew of the Polaris, who had arrived that day at Dundee, Scotland, in the English whale steamer Arctic. I immediately returned to St. John's, when I received telegraphic instructions to "await here the arrival of the Tigress."

October 16, 1873, the Tigress arrived at St. John's, and October 19, 1873, I sailed, in obedience to telegraphic orders, from St. John's for New York, at which port I arrived October 25, 1873.

I beg leave to inclose also a tracing of a chart showing the tracks of the United States steamers Juniata, Tigress, and steam-launch Little Juniata, in the prosecution of the search in the Arctic regions for the Polaris, her officers and crew, during the months of July, August and September, 1873.

I send to the Department a book containing specimens of flowers,

ferns, mosses, and plants gathered in Greenland, with the latitude specified, also the elevation above the level of the sea.

In conclusion, it is with great pleasure I refer to the spirit which prevailed among the officers and crew of the Juniata, the zeal, energy, alacrity, and willingness of all to face every danger which we encountered, the spirit of emulation to prosecute the search at all hazards with the limited means at our command, the continuous volunteering for all kind of duty, enables me to speak of all in the highest terms of praise, and permits me to commend them to you as worthy of the Department's consideration when they are needed for duty calling for a high order of professional skill and confidence.

I am, sir, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U S. N., commanding U. S. Steamer Juniata.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

NAVY DEPARTMENT, *October* 30, 1873.

SIR: The Department has this day authorized Vice-Admiral Rowan to grant two weeks' leave to the officers and one week's leave to the crew of your vessel, in such parties and at such times as you may suggest.

This is granted in consideration of the arduous services in the Arctic regions, from which you have just returned.

Respectfully,

GEO. M. ROBESON,
Secretary of the Navy.

Commander D. L. BRAINE, *U. S. N.*,
Commanding U. S, Steamer Juniata, New York.

UNITED STATES STEAMER JUNIATA, (3d rate,)
Navy-Yard, New York, November 1, 1873.

SIR: I have the honor to acknowledge the receipt of the Department's communication of the 30th ultimo, and with pleasure thank the honorable Secretary of the Navy for his appreciation, as expressed therein, of the services of the officers and crew of the ship under my command, during her voyage in the Arctic region in search of the Polaris, her officers and crew, during the months of July, August and September, 1873.

I have the honor to be, sir, very respectfully, your obedient servant,

D. L. BRAINE,
Commander U. S. N., commanding U. S. Steamer Juniata.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

PROCEEDINGS OF THE TIGRESS IN THE SEARCH FOR THE POLARIS.

NAVY DEPARTMENT,
Washington, July 10, 1873.

SIR: The Tigress has been purchased and commissioned by the Navy Department, and prepared in all respects to go the rescue of the Polaris, her records, officers and crew. She was built of extra strength for voyages amongst the ice, and has been materially strengthened since her purchase by the Department, in order to render her better adapted for the service she is now to undertake. You have been appointed to her command, and you will, as such commander, carefully carry out the following instructions:

When entirely ready for sea, you will proceed directly to St. John's, Newfoundland. At that place you will fill up with coal adapted for her use, taking as much in her bunkers and on deck as you can safely carry. Thence you will make the best of your way to Godhavn, on the island of Disco, on the west coast of Greenland, taking for that purpose the most open navigable route and keeping a lookout, as you proceed, for the Polaris and for the Juniata. If you fall in with the Juniata, at this or any other time, you will communicate with her, show your instructions to Commander Braine, and deliver to him the inclosed orders. Should you meet the Polaris alone, you will render every assistance necessary and afford her convoy direct to New York. Otherwise, on arriving at Godhavn, you will ascertain from the Danish authorities whether any information has been received from the Polaris or her crew; and you will probably there find letters from the Juniata, giving you information as to her movements, and such news and information of the Polaris expedition as she may have obtained.

After procuring such information, and supplying, as far as possible, all your wants at Godhavn, you will leave with the Danish authorities a report to the Department of your proceedings thus far, (requesting their transmission to the United States by the first opportunity,) and you will then proceed northward to Northumberland Island, keeping a careful lookout for any signs of those of whom you are in search, going by the way of Upernavik and Tessuisak, unless by falling in with the Polaris, or with some of her officers and crew, before reaching these points, or by reason of the receipt of some positive and reliable information concerning them and their situation, your further progress is rendered unnecessary.

If, however, you do not fall in with the Polaris or her people on the way, or no such positive and certainly reliable information reaches you, you are to push on, by every means in your power, for the position in which the ship was last reported by those of her crew who were rescued by the Tigress, namely, under Northumberland Island, in latitude 77° 35′ north, and continue your search until you find them or obtain satisfactory information concerning them and the ship, or until you are compelled to abandon it by want of means, subsistence for yourself and crew, or by other reasons entirely beyond your control. If the Polaris, wherever found, can be brought home, she is not to be abandoned, but you will take charge of her, and, putting proper officers and crew on board, bring her to New York. If she cannot be saved by any means in your power, then her officers and men, her records, scientific and nautical, and everything of value that can be removed, will be transferred to the Tigress and brought by her to the United States.

The Department desires that you will endeavor to rescue and bring home—

First. The officers and crew of the Polaris;

Secondly. The records, scientific and nautical; and,

Thirdly. The ship.

Each of these to be saved in the order named, at the sacrifice, if necessary, of the others later in order of importance.

It is the hope of the Department that in prosecuting this search you will not be detained by the ice or by any other cause so long as to prevent your return during the autumn of the present year. If, however, circumstances compel you to winter in a northern latitude, you will take every precaution to secure the Tigress in a safe anchorage, promoting in every way the health and comfort of those under your command during the dangerous and trying months which must ensue, keeping up your watchfulness during the winter, and when the season opens again renewing your search and prosecuting it until prudence constrains you to return homeward, by no means remaining in the Arctic latitude after the navigation closes next year unless, on your judgment as an educated and responsible naval commander to whom is intrusted a Government ship with its officers and crew, you should think that the objects of your expedition and all the circumstances of the case fully justify you in such course.

Mr. Tyson, late of the Polaris, goes with you as ice-master and pilot. His knowledge of the navigation of Davis Strait, the result of much experience in those waters, and his recent service on the Polaris further north, will render his presence on board the ship of great value.

A competent assistant is also supplied to meet with the possibility of accident to or disability of Mr. Tyson. Six of the seamen of the Polaris, rescued with Mr. Tyson, will also form part of your crew, and may be considered as excellent hands in the service in which you are engaged.

The Esquimaux Hans and his family will be received on board of the Tigress, comfortably cared for, and landed at Godhavn, Upernavik, or such other port as he may desire, which may not interfere with the objects of your expedition; or, if he is willing, and you desire it, he may be retained to assist in your search at the same pay he is now receiving. If discharged, Hans is to be paid off in full. "Esquimaux Joe" will also accompany you, to be employed as you may find his services available, and to return with you to the United States. You will find him most trustworthy, and valuable as a hunter and sledge-driver, and can rely upon his fidelity and experience.

While you are in company with the Juniata you will of course be under the orders of the senior officer present, subject, however, to the orders of the Department, and when separated from that ship you will carry out your instructions to the best of your own ability and discretion, having due regard to the object for which the Tigress has been commissioned, fitted, and placed under your command—that is, to penetrate through the ice, if necessary, to Northumberland Island, to rescue the Polaris, her records, and people, or to ascertain their fate, and to return either this year or next, as may be possible, to the United States.

If it should be your good fortune to rescue the Polaris, you are authorized to put your own officers on board, and to convoy her to New York; but you will touch at such places of rendezvous on your return southward as may have been appointed for you to meet the Juniata; and, failing to meet her at any of them, you will proceed to Godhavn, where the Juniata is finally, under the orders of the Department, to await your arrival as long as the navigation remains open this season; and, in this

event, you will be subject generally for your further instructions to the senior officer present, who will, however, allow you to bring in the ship you have rescued, and will not interfere with your orders for that purpose unless the interests of the service shall specially require it.

If, however, on your arrival at Godhavn, on your return homeward, either this year or next, you do not find there a senior officer, you will discharge all the obligations you may have incurred at that place, embark such of the stores and coal as remain there, and, if you have the Polaris in company with you, leave her there should prudence demand it, and if not, convoy her to New York, making from this port a report of your return, and of the particulars of your voyage, to the Department.

Special orders have been given to Commander Braine, commanding the Juniata, directing him to facilitate by every means in his power your advance northward, as the expedition specially fitted and intended to encounter the ice; and advising him that it is upon your specially fitted ship and selected crew that the Department relies to meet and overcome the dangers and difficulties of an Arctic voyage, to which the Juniata is not to be voluntarily exposed; and further directing him to permit you to prosecute your search after parting company with him according to your own discretion, under your orders, and to convoy the Polaris home, should you rescue her; and directing him not to interfere with the *personnel* of your ship, except at your request or under the pressure of imperative professional necessity.

Full reports of the examination of the portion of the crew of the Polaris rescued from the ice will be furnished you, with all the information resulting therefrom.

Relying upon your zeal, discretion, and professional knowledge and spirit, the Department bids you God-speed, and commends you and your comrades, and the result of your difficult and dangerous enterprise, to His overruling and all-wise providence.

Very respectfully, your obedient servant,

GEO. M. ROBESON,
Secretary of the Navy.

UNITED STATES STEAMER TIGRESS,
Navy-Yard, New York, July 14, 1873.

SIR: I have the honor to transmit a list of "passengers" of this vessel.

Very respectfully, your obedient servant,

JAS. A. GREER,
Commander, Commanding.

Hon. G. M. ROBESON,
Secretary of the Navy, Washington, D. C.

FORM No. 10.—PASSENGERS.

List of officers or others about to sail, as passengers, in the United States steamer Tigress. Dated at New York, the 14th day of July, 1873.

Names.	Remarks.
Hans Christian, wife, and 4 children.	Bound to Greenland.

Very respectfully,

JAS. A. GREER,
Commander, Commanding.

UNITED STATES STEAMER TIGRESS,
Off Pollock Rip, July 16, 1873—7 a. m.

SIR: I have the honor to inform you that this vessel sailed from the navy-yard, New York, at 5.10 p. m., July 14. The weather has been pleasant and the sea smooth, giving us no chance to test the qualities of the vessel. All on board are well. I send this by the sound pilot. Three of the seamen of the Polaris, viz, G. W. Lindguist, J. Kruger, W. Nindermann, are on board. The others did not report on board.

Mr. Stickney, I presume, has informed you of his action as to paying the men. I filled up our complement from the Vermont. We have on board 11 officers, 32 men, and 7 Esquimaux.

Very respectfully, your obedient servant,

JAS. A. GREER,
Commanding.

Hon. G. M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES STEAMER TIGRESS,
St. John's, Newfoundland, July 23, 1873.

SIR: I have the honor to inform you that we arrived here this morning, after a passage of eight and a half days from New York. We had one moderate gale, of a few hours' duration, in which the vessel showed herself to be a good sea-boat. As a steamer she may be classed as a "five-knot" one.

The engineer proposes to make a change in the furnaces, which may increase the speed. I expect to sail for Disco in two days. We saw our first icebergs off Cape Race. All hands are well.

I send this by the mail-steamer, which leaves to-day.

Very respectfully, your obedient servant,

JAS. A. GREER,
Commander, Commanding.

Hon. G. M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES STEAMER TIGRESS,
St. John's, Newfoundland, July 26, 1873.

SIR: I have the honor to inform you that, having filled up with coal and other stores, we sail to-day for Disco.

I have exchanged with the governor the courtesies usual at this place. All are well.

Very respectfully, your obedient servant,

JAS. A. GREER,
Commander, Commanding.

Hon. G. M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES STEAMER TIGRESS,
Godhavn, Disco Island, August 8, 1873.

SIR: I have the honor to inform you that we arrived at this place on the 6th instant, ten and a quarter days from St. John's, Newfoundland, after a somewhat boisterous passage, during which the vessel showed her good qualities as a sea-boat.

By some changes made in the furnaces we have been able to obtain a speed which will authorize me to class the Tigress as a 6-knot steamer under favorable circumstances.

The Juniata sailed for Upernavik July 29, having taken all the anthracite coal which was here, and leaving for this vessel about sixty-five tons of Cardiff coal, which will not fill up by twenty-five tons.

As fuel is essential to this vessel for carrying out the wishes of the Department, I intend, when I meet the Juniata, to request Commander Braine to supply us with anthracite coal sufficient to fill our bunkers.

Owing to the short-handedness of the crew, and the impossibility of obtaining a sufficient force from Godhavn, the handling of the coal here has caused a detention of a day.

I beg to call your attention to the fact that there is now no coal on the Greenland coast. Should we be so fortunate as to fall in with the Polaris this season, and be able to reach a Danish settlement, she will be, (no matter how seaworthy,) in all probability obliged to remain there until supplied with coal next year. Should this vessel be obliged to spend a winter in the ice, the need of a supply of coal, to be in readiness for us on our return to the southward, will be apparent.

Mr. Smith, the inspector of North Greenland, is absent, but I have been courteously received by Mr. Müldrüp, the governor of Disco Island.

At St. John's two men deserted, viz, George Gray, (quartermaster,) and William Bayes, (carpenter's mate.) I shipped at that place one seaman, one man since rated carpenter's mate, and one machinist to take the place of a man who is physically disabled. I propose, in due form, and with Commander Braine's consent, to send him and one of the seamen who has proved to be worthless on board of the Juniata.

All hands are well, with the exception mentioned.

We sail for Upernavik this afternoon. I will have this letter sent (leaving a duplicate here) by a vessel which sails for Denmark soon.

* * * * * * *

Very respectfully, your obedient servant,

JAS. A. GREER,
Commander, Commanding.

Hon. G. M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES STEAMER TIGRESS,
Off Upernavik, Greenland, August 11, 1873.

SIR: I have the honor to report that this vessel arrived here yesterday, thirty-nine hours from Godhavn, island of Disco.

The Juniata is here. Commander Braine has done everything in his power to facilitate our departure, and I expect to sail this afternoon for Tessiusak and the northward.

Thomas Harrington (captain of top) broke his leg at Godhavn. He and two other men have been transferred to the Juniata. Commander Braine has furnished men to take their places.

I cannot find at this place the copy of the agreement made with Hans Christian. I have paid him off in accordance with the terms mentioned by Captain Hall in one of his letters to the Department, viz, "fifty Danish dollars per month," for twenty-three and a half months, equal to $640.09 in American gold.

I have received from the Juniata thirty-seven and a half tons of anthracite coal.

There are on board of this vessel 45 persons, viz, 12 officers, 32 men, (including the apothecary,) and "Esquimaux Joe."

All hands are well.

Very respectfully, your obedient servant,

JAS. A. GREER,
Commander, Commanding.

Hon. G. M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES STEAMER TIGRESS,
Off Godhavn, Island of Disco, Greenland, August 25, 1873.

SIR: I have the honor to report that this vessel sailed from Upernavik, North Greenland, on August 11, 1873, at 5.10 p. m., a Danish pilot being on board.

At 11.45 p. m. arrived at Tessiusak. On approaching the anchorage, and while forging ahead slowly, the engine caught on center. Let go the anchor, but failing to bring the vessel up, she ran lightly upon a smooth rock. Backed off in a few minutes; no damage done. Governor Janses came on board, having no information. I accepted his services as pilot to clear us of the islands.

August 12, at 1.15 a. m., stopped and communicated with the Juniata's steam-launch. Obtained no information about Polaris.

At 1.45 a. m. discharged pilots, parted company with steam-launch, and stood to the northward.

August 13, at 10 a. m., passed Cape York. Heavy pack-ice prevented our getting very close, yet we were near enough to clearly observe any signals that might have been made. A bright lookout was kept at all times.

From Cape York skirted the shore as closely as safe navigation would permit. This was also done upon our return. At 9 p. m. examined North Star Bay.

August 14, examined Netihk Harbor; skirted Northumberland Island. Being convinced that this was not the place where the separation of the party on "ice-floe" and Polaris occurred, continued on for Capes Parry and Alexander. Examined Hartstene Bay. At 9 p. m., having passed Littleton and McGary Islands, feeling quite sure that this was the place we were seeking, stood well in and lowered a boat.

Discovered (one month and four hours after leaving New York) a camp, which, upon examination, proved to be the one which was occupied by crew of Polaris last winter. It is now occupied by Esquimaux, who seem to be quite intelligent. From them I learned that they came from Pond's Bay, on a hunting expedition, and found the Polaris secured to the rocks, the crew living on shore. That they had built two boats out of material taken from the vessel, fitted them with oars and sails,

and about one moon or so ago, or when the ducks began to hatch, (which I think was about the middle of June,) they all being well, had gone to the southward. Also, that Captain Buddington, the head man, before he departed told him (the chief Esquimaux) that he could have the vessel.

A gale of wind came on some time after the departure of the crew; the vessel broke adrift, (I saw the broken hawsers,) and, drifting about a mile and a half toward the passage between Littleton Island and the main land, sank. The native said he saw her go down, and regretted her loss very much. He went with Lieut. Commander H. C. White to the place, but two small (comparatively speaking) ice-bergs, with a heavy floe about them, covered it, having doubtless "grounded" upon the wreck, which caused their detention at the spot, as there were 7 to 11 fathoms of water around it.

At the camp a comfortable wooden house had been constructed, having in it bunks, mattresses, furniture, galley, &c.

The natives had two tents, made out of canvas, evidently from the Polaris. A rough carpenter's bench, with many shavings about it, was in the camp. Provisions, instruments, books, and stores of various kinds were scattered around the small camp in every direction, and all in quite bad condition.

I caused to be brought on board all the manuscript matter, including a mutilated log-book, all the books which were not torn to pieces, some fire-arms and broken instruments, the ship's bell, and some medical stores. The provisions and other stores were of no earthly value, and I did not bring them off. A cairn or place of concealment for papers and records was sought for, but none could be found.

The weather was quite threatening, thick, squally, and snowing at times, with an ice-pack to the northward, extending as far as the eye could reach across Smith Sound.

At 2.15 a. m., August 15, I stood to the southward, keeping a lookout for the people. The position of what I call "Camp Polaris" is, as taken from the chart, latitude 78° 23′ north, longitude 73° 46′ west.

At noon, August 16, passed Cape York near enough to have seen signals. Found much ice about it, and stood for Melville Bay.

August 19, at 2.30 p. m., communicated with Governor Janses, at Tessiusak; obtained no news. At 9.30 p. m., anchored at Upernavik; nothing had been heard there of the crew of the Polaris. Remained at Upernavik, overhauling and repairing machinery, until August 23, 2 p. m., when we sailed for this place, arriving here August 25, 2 a. m., being almost positively assured in my own mind that the crew of the Polaris have been taken on board a whaler. The following-named are known to have passed to the northward this year, viz: Asuk, or Asik, of Dundee; Arctic, believed to be of Dundee; and seven others whose names I have not been able to learn, and they all (those that have been spoken) expected to sight Cape York.

I have concluded, in accordance with my instructions from the Department "to make a thorough search for the crew," to go to the west side of Davis Strait, skirting the pack until I find a chance to get through, then to work to the northward in search of the whalers, who, on their return voyage, follow the western shore. The search will be continued as long as prudence will justify, taking into consideration the condition of the ice and our supply of fuel, (which will be used economically.) I will then proceed to St. John's, Newfoundland. We have now on board 155 tons of coal.

I expect to sail to-day. All hands are well. Appended is a chart showing "Camp Polaris."

Very respectfully, your obedient servant,

JAS. A. GREER,
Commander, Commanding.

Hon. G. M. ROBESON,
Secretary of the Navy, Washington, D. C.

P. S.—Since writing the above, I have received from Commander Braine, of the Juniata, 13 tons of coal.

JAS. A. GREER.

Forwarded.

D. L. BRAINE,
Commander U. S. N., Commanding Juniata, and Senior Officer Present.

UNITED STATES STEAMER TIGRESS,
Niantihk, Cumberland Sound, September 15, 1873.

SIR: I have the honor to inform you that this vessel sailed from Godhavn, Disco, on August 25. We stood for the west side of Davis Strait, and on the 26th, in latitude 67° 30′ north, longitude 60° 15′ west, fell in with the pack, as it extended well to the north and east. I skirted it to the south and west, going into every lead that indicated a passage. When in the neighborhood of Cape Searle, found that the ice was packed tight to the shore; worked out, and tried to get into Exeter Bay, with same result. Having been informed that the Scotch whalers at times ran into Cumberland Sound at the close of their season, and being short of coal, I determined to come to this place.

South of Cape Walsingham we had a heavy gale, which lasted three days, during which it was necessary to lie to under steam and sail.

We arrived here on September 4, and have, when the weather would permit, been engaged in getting on board stone ballast.

* * * * * * *

I expect to sail to-morrow for Tonhik, Greenland. After obtaining at that place, all the coal possible, I will sail for the narrow part of Davis Strait, and cruise for the purpose of intercepting some one of the whaling fleet.

The Tigress may be expected at St. John's, Newfoundland, in the latter part of October. All are well.

Very respectfully, your obedient servant,

JAS. A. GREER,
Commander, Commanding.

Hon. G. M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES STEAMER TIGRESS,
Toigtut Sound, Greenland, October 4, 1873.

SIR: I have the honor to inform you that this vessel sailed from Niantihk, Cumberland Sound, on September 16. After a boisterous passage and one very heavy gale, we reached this place on September 27, having stopped a day at Sanernt on account of a head gale.

The authorities here have been very courteous, and have done everything in their power to assist us.

From Mr. S. Fritz, the very obliging agent of the Kryolith Company, I have obtained 190 tons of coal. In accordance with his desire, (as he

does not know what the company will charge,) I have given him receipts for the coal, which he will forward to the New York agent of the company, Mr. C. Ed. Habicht, 68 Broadway, who will present the bill to the Department.

We, as usual, have much work to do to the machinery. For several days before our arrival here we were obliged to work high pressure, which reduced our speed very much.

We have heard nothing of the crew of the Polaris. I expect to sail to-day for the northward, keeping a lookout for the whalers. I shall cruise as long as the season will justify, and then proceed to St. John's, Newfoundland.

On the day that we left Niantihk, I supplied the American schooner Helen F., of New London, Conn., (which was in need of them,) with a few stores at Government prices. All hands are well.

Very respectfully, your obedient servant,

JAS. A. GREER,
Commander, Commanding.

Hon. G. M. ROBESON,
Secretary of the Navy, Washington, D. C.

[Telegram.]

ST. JOHN'S, NEWFOUNDLAND, *October* 17, 1873.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C., United States:

Tigress arrived. All well. Sail for New York in a week. Met no whalers. Had a bad time in Davis Strait.

JAS. A. GREER,
Commander, Commanding.

UNITED STATES STEAMER TIGRESS,
Navy-Yard, New York, November 10, 1873.

SIR: I have the honor to inclose a list of passengers brought to the United States in this vessel.

Very respectfully, your obedient servant,

JAS. A. GREER,
Commander, Commanding.

Hon. GEO. M. ROBESON,
Secretary of the Navy, Washington, D. C.

FORM No. 10.—PASSENGERS.

List of officers or others about to sail as passengers in the United States steamer Tigress, from St. John's, Newfoundland, to New York, dated at St. John's, New Foundland, the 30th day of October, 1873.

Name.	Remarks.
Louis Moisette ..	A distressed American citizen, sent home by United States consul at St. John's. He served as a ward-room boy, and was of no expense to the Government.

JAS. A. GREER,
Commander, Commanding.

P. S.—The above-mentioned man came to New York in the Tigress.

JAS. A. GREER

No. 15.

PROTECTION TO AMERICAN CITIZENS AND PROPERTY AT PANAMA.

SOUTH PACIFIC STATION,
UNITED STATES FLAG-SHIP PENSACOLA,
Bay of Panama, U. S. C., May 13, 1873.

SIR: I have the honor to inform the Department that as soon as I had dropped anchor at this place, on the 7th instant, Commander Belknap, of the Tuscarora, called upon me and reported that the parties contending for the possession of the government of the state of Panama had commenced hostilities, and at that time fighting was going on between them. That he had been called upon by our consul to furnish protection to the citizens of the United States and the railroad depot, and had promised to send a force on shore at such time as the consul should designate, and a certain signal would be made on shore in the event of the force being needed.

I approved of Commander Belknap's course, and gave orders to Captain Upshur, of this vessel, to have in readiness, to send on shore at a moment's warning, a force of one hundred men and two pieces of artillery.

At about 5 p. m. the signal as agreed upon was made, when the force above mentioned was promptly sent to the railroad depot for its protection and the immense quantity of property therein stored. The officer in command of this force, Lieut. T. B. M. Mason, United States Navy, was ordered to confine himself alone to the protection of the railroad depot and property, and not to enter the town.

An hour later I received a communication from the United States consul, Mr. Long, a copy of which is herewith transmitted, marked A, calling upon me to send an armed force of one hundred and fifty marines into the town for the protection of himself and others.

As it was near night when the request reached me, I deemed it unwise to comply with it, as I could not feel justified in landing and marching through a strange city at night the force asked for; and, besides, I considered that I had no right to land men on the soil of a friendly power without the consent of the authorities.

The day following, a deputation of gentlemen, bearing a letter signed by the most respectable and influential American and foreign citizens of Panama, and accompanied by a letter from the United States consul, (copies of which are enclosed, marked B, C,) requesting that for their protection and that of their property I would place in the town an armed force of one hundred men, stating at the same time that the chiefs of the contending parties had given their consent that this should be done. It was also represented to me that the moral effect of the presence of a respectable force from this squadron would tend materially to inspire confidence and prevent any lawlessness on the part of evil-disposed persons.

In compliance with this request, I increased the force then on shore to two hundred marines and blue-jackets, with four pieces of artillery, to be equally divided between the city and the railroad station.

Captain Upshur placed this force under the immediate command of Lieut. Commander P. F. Harrington, of this vessel, and Lieut. Commander Theo. F. Jewell, of the Tuscarora, as will be seen by his letter to me, a copy of which is inclosed, marked D.

On the 9th instant a truce was asked for by the Correoso party, with

a view to burying their dead, which was granted. Subsequently an appeal was made to the foreign consuls by both parties to use their influence toward a cessation of hostilities, but they declined doing so, deeming it prudent to abstain from any interference.

The Correoso party then agreed to disarm, naming an hour, which was postponed from time to time, but eventually there was a surrender of their arms, and now all is quiet.

The political affairs of this state are in such a muddle that I am wholly unprepared to give any lucid explanation of the causes which have led to this last *émeute*. I send herewith editorials from the Panama Star and Herald, the local paper of the Isthmus. The statements, so far as I can judge, are correct.

The killed and wounded in the strife foot up one hundred, more than half of whom were killed.

It gives me pleasure to state that the conduct of our officers and men, with a few exceptions among the latter, has been most commendable.

* * * * * * *

Very respectfully, your obedient servant,

CHAS. STEEDMAN,
Rear-Admiral, U. S. N., Commanding U. S. Naval Force, South Pacific Station.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

A.

UNITED STATES CONSULATE,
Panama, May 7, 1873.

SIR: A deplorable state of matters in Panama requires the presence of not less than one hundred and fifty marines to protect American interests during the night. I have informed both parties of my intention to appeal to you for ample protection.

I have the honor to be, your obedient servant,

OWEN M. LONG,
United States Consul.

Rear-Admiral STEEDMAN,
Commanding United States Naval Forces, South Pacific.

P. S.—During the night the signal for additional aid will be three rockets, followed, after a short interval, by three more.

B.

UNITED STATES CONSULATE,
Panama, May 8, 1873.

SIR: I beg leave to introduce to you the gentlemen who are bearers of this communication. They represent the various interests centered in business in this city. Many of the names are those of Americans who have their families and fortunes in this city. They can give you a thoroughly accurate statement of the present condition of affairs in this city.

I have the honor to be, with respect and esteem, your obedient servant,

OWEN M. LONG,
United States Consul.

Rear-Admiral CHAS. STEEDMAN,
Commanding United States Naval Forces, South Pacific.

C.

PANAMA, *May* 9, 1873—8 a. m.

SIR: The undersigned, foreign residents in Panama, beg to acquaint you of the fact that since 12 noon yesterday a contest has been going on in this city between the federal troops stationed here for the protection of the transit, and the state forces; that indiscriminate firing, endangering the lives of all residents, has continued since the hour before mentioned; that both parties threaten that sooner than surrender, they will fire the town; and that even if this threat be not carried out, it is to be feared that great excesses will be committed by either party which may be victorious; that the lives and property of the whole of the undersigned will be seriously imperiled if such excesses are committed; that the landing of an armed force of any foreign power here is of more value as a moral force than any other step that can be adopted; and that they therefore beg you, as commander of the only foreign force here, and the chief naval representative of the United States of America, with which power Colombia has treaties providing for such emergencies, to at once send such a force on shore as shall put a stop to such perilous and anomalous state of affairs.

H. SCHUBER,
JAS. BOYD,
F. EDMUNDS,
D. M. CORWINE,
GEO. REICKER,
H. M. KEITH,
D. GOLDSMITH & CO.,
S. L. ISAAC and ASH,
G. W. PIERCE,
S. L. LANGSBURGH & CO.,
HENRY EHRMAN,
BOSTON ICE COMPANY,
And many others.

Rear-Admiral CHARLES STEEDMAN,
Commanding United States Naval Forces, South Pacific.

D.

SOUTH PACIFIC STATION,
UNITED STATES FLAG-SHIP PENSACOLA,
Panama, U. S. C., May 13, 1873.

SIR: In obedience to your order, I have to report that a force of one hundred blue-jackets and marines, with two howitzers, were landed from this vessel and Tuscarora on the 7th instant, at the railroad station, with orders to protect the buildings and property therein stored, and that subsequently, by your further orders, one hundred additional men and officers were landed, with two howitzers. This force was placed under the command of Lieut. Commander P. F. Harrington, and equally divided, one hundred being left at the depot, under the immediate command of Lieut. Commander T. F. Jewell, of the Tuscarora, and one hundred placed within the city, a detail from the division being sent to the United States consulate for its protection, the whole under the command of Lieut. Commander P. F. Harrington.

The moral effect of the presence of this force was, as you had foreseen, to inspire confidence, affording security to the lives and property of American and other foreign merchants and residents, and exercised a measurable restraint over the belligerents.

Hostilities between the contending parties having ceased on the 10th, it was deemed expedient to keep our force *in statu quo;* however, the civil authorities of the town being re-established on the day follow-

ing, a request was made that our people be withdrawn from the city, which was complied with, but a sufficient force continued at the railroad depot. I therefore withdrew from the town and returned to the United States steamer Tuscarora her men and officers. I have left at the railroad station sixty men and two howitzers, under the command of Lieut. T. B. M. Mason.

In closing this report, I beg leave to call your attention to the thorough, satisfactory, and able manner in which our operations on shore have been conducted, all the more delicate from the fact that we were neutrals. To Lieut. Commander P. F. Harrington and Lieut. Commander T. P. Jewell, and to the officers and men under their command, great praise is due for the intelligent, earnest, and complete manner in which the duty you have given them has been performed. It has excited much remark on shore, and met with universal commendation. Lieut. Commander P. F. Harrington and Lieut. T. B. M. Mason, and the officers and men of the ship, forming very much the largest part of the force on shore, have come more directly under my observation, and it gives me great pleasure in mentioning the zeal and discipline they have manifested under circumstances well calculated to try both officers and men, and gives ample proof that the crew of a well-organized ship can, when required so to do, perform on shore all the duties of a well-trained soldier.

Very respectfully,

J. H. UPSHUR,
Captain and Chief of Staff.

Rear-Admiral CHARLES STEEDMAN, U. S. N.,
Commanding United States Naval Force, South Pacific Station.

SOUTH PACIFIC STATION,
UNITED STATES FLAG-SHIP PENSACOLA, (2d rate,)
Bay of Panama, U. S. of C., October 6, 1873.

SIR: In my dispatch No. 1, dated the 22d of September, 1873, I informed the Department that I had on that day relieved Rear-Admiral Steedman, in command of the United States naval force on the South Pacific station.

I was not long permitted to be idle and without something to do. A revolution had been brewing in Panama and vicinity for some weeks.

* * * * * * *

On the 24th of September affairs seemed to be approaching a crisis. In the afternoon of that day, I landed a force of one hundred and thirty men, well armed and equipped with howitzers and rifles, under competent officers, and stationed them at the Panama Railroad depot for its protection, and to be ready to furnish escorts on the railroad trains to Aspinwall to guard the passengers and specie which were being daily transported over the road.

The President of Panama had previously notified the United States consul that, under the present circumstances, he was unable to give the Panama Railroad that protection and safeguard guaranteed in the treaty.

This movement was quite opportune, as that night at midnight the "ball opened," and the conflicting forces commenced firing upon each other, about two miles outside of the city, but it did not prove serious to either party.

The firing was resumed and continued at intervals the following day, and has continued up to this time of writing.

I afterward increased the force on shore to one hundred and ninety men, stationing detachments to protect the American consulate and other American houses and American property.

There are now four lines of steamers communicating with Panama, viz, the American, (two lines, the San Francisco and the Central America,) English, and the French, whose passengers, freight, and specie have to be transported over the Panama Railroad. By care, attention, and hard work, the American naval force has securely protected the transit and passengers, and their effects have been, up to this time, transported over the railroad without any delay.

The United States ship Benicia, Capt. A. G. Clary, of the North Pacific squadron, happened in here very opportunely, and the ship and officers have done good service in rendering me important aid.

Lieut. Commander J. D. Graham, the executive officer of the Benicia, has commanded the forces stationed at the city, and Lieut. Commander Allen D. Brown, the executive officer of the Pensacola, has command of the forces at the railroad. Both of these officers have performed their duty with good judgment and efficiency.

* * * * * * *

October 8.—*Later.*—On the 6th instant hostilities ceased, the outside or besieging party, under General Correoso, withdrawing a few miles into the interior, being deficient in ammunition and other supplies. This enables us to move about without the fear of being hit by bullets from one party or the other.

In course of time revolutionary movements will, perhaps, be again the order of the day.

There is not the necessity for keeping so large a force on shore, and I have withdrawn all but thirty men to the ships.

A small force is still required, at least for a few days, as a precautionary measure at the railroad depot, and to guard the road in case of the re-appearance of the revolutionary forces.

The mail-steamer is just in from San Francisco, and I shall see that the passengers, mails, specie, baggage, and freight are all conveyed without molestation over the road to Aspinwall to-day.

I am, sir, very respectfully, your obedient servant,

JOHN J. ALMY,
Rear-Admiral, U. S. N., Commanding United States Naval Force, South Pacific Station.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

No. 16.

MERITORIOUS SERVICES AND CONDUCT.

UNITED STATES STEAMER COLORADO, (1st rate,)
FLAG-SHIP ON THE ASIATIC STATION,
Hong-Kong, China, November 5, 1872.

SIR: I have the honor to forward to the Department a copy of a letter from Commander R. R. Wallace, commanding, reporting an act of distinguished gallantry done by Lieut. Commander Douglas Cas-

sel, United States Navy, executive officer of the United States steamer Ashuelot.

Knowing from my own recent observation of the Pei-Ho River, at Tien-Tsin, the great personal peril which Lieutenant-Commander Cassel unhesitatingly incurred in jumping into the always rapid, and, at the time of the occurrence, the swollen and turbulent current, to rescue from drowning one of the ship's company, I beg leave to represent his act as of the most honorable, manly, and courageous kind.

But for Lieutenant-Commander Cassel's very prompt, self-reliant, and self-forgetful action, the carpenter's mate, who had fallen overboard while in the discharge of his duty at general quarters, would inevitably have been drowned; and but for his coolness, resolution, and strength, Lieutenant-Commander Cassel himself might have met the same fate.

I have the honor and pleasure to respectfully commend Lieutenant-Commander Cassel's heroic action to the special notice of the honorable Secretary.

Very respectfully, your obedient servant,

THORNTON A. JENKINS,
Rear-Admiral, U. S. N., Commanding U. S. Naval Force on the Asiatic Station.

Hon. GEO. M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES STEAMER ASHUELOT, (3d rate,)
Tien-Tsin, China, October 14, 1872.

SIR: I have the honor to inform you that during exercises at general quarters this morning the carpenter's mate was sent over the side to plug a shot-hole. The lanyard to the slings was not well secured, and, as soon as a strain was brought on it, it sundered, and he fell overboard. He would have been drowned, (as he had on a heavy pair of canvas-slings, tools, &c., which rendered him helpless,) but for the prompt assistance of Lieut. Commander Douglas Cassel, who jumped overboard and succeeded in getting him on the port quarter-post, and kept him there until a boat could be got to them. Mr. Cassel's gallant conduct is worthy of the highest praise. Had he missed the quarter-post, they would both have been drowned, as the current was so strong it would have been impossible to have kept afloat, loaded down as they were, long enough to get a boat to them.

I am, sir, very respectfully, your obedient servant,

R. R. WALLACE,
Commander, Commanding.

Rear-Admiral THORNTON A. JENKINS,
Commanding United States Naval Force on Asiatic Station.

NAVY DEPARTMENT, *January* 6, 1873.

SIR: I take great pleasure in furnishing you with a copy of dispatch, dated the 29th of November last, received by the Department from Rear-Admiral Thornton A. Jenkins, commanding the United States naval force on the Asiatic station; also, with a copy of a report which accompanied it, relative to your heroic conduct in saving from drown-

ing the carpenter's mate of that vessel, who fell overboard into the river Pei-Ho, near Tien-Tsin, during exercise at general quarters.

It is very gratifying to the Department to receive and place on its files such evidence of the self-sacrificing spirit and devotion of the officers of the Navy, and any acknowledgment which it could make of it would scarcely be so satisfactory to you as the appreciative and complimentary letter of the commanding officer of the station.

This instance of your coolness and courage gives additional luster to your history as recorded in the official reports of your services in the face of the enemy at the capture of the Corean forts.

Very respectfully,

GEO. M. ROBESON,
Secretary of the Navy.

Lieut. Commander DOUGLAS CASSEL,
United States Steamer Ashuelot, Asiatic Station.

UNITED STATES STEAMER OMAHA, (2d rate,)
At Sea, lat. 37° 6′ *S., long.* 52° 2′ *W., January* 7, 1873.

SIR: I have to report the death of John Owens, rated a carpenter, on board of this vessel.

The death of the above-named John Owens occurred on the 7th day January, 1873, at sea, and in the line of duty.

While at work on the fore-topsail yard the standing part of the runner gave way, letting the yard down by the run, and jerking Owens overboard, after striking the rail of the pivot-gun port with such force as to break it. As he floated by the after part of the ship, Lieut. Seth M. Ackley seized a rope and sprang overboard to his assistance, succeeding in getting hold of him, but unable to retain it or the rope on account of the vessel's headway. The man sinking, Mr. Ackley swam to the life-buoy, and was brought on board by life-boat, uninjured.

I would respectfully call the attention of the Department to Mr. Ackley's gallant attempt to save life.

Very respectfully, your obedient servant,

JNO. C. FEBIGER,
Captain, Commanding.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

NAVY DEPARTMENT, *May* 2, 1873.

SIR: Your commanding officer, Captain Febiger, has very properly considered it his duty to report to the Department your gallant conduct on the 7th of January last, in endeavoring, at the imminent risk of your life, to rescue one of the crew of the Omaha from drowning.

One who is capable of such an act of chivalry, or rather of philanthropy, backed by intrepidity, does not need the applause of the world. Providence takes care to give a due and sufficient reward. But it is the duty of the Department to assure you, and leave it on record, that your generous disregard of self is known and appreciated.

Very respectfully,

GEO. M. ROBESON,
Secretary of the Navy.

Lieut. SETH M. ACKLEY, U. S. N.,
United States Steamer Omaha, South Pacific Station.

WASHINGTON, D. C., *January* 26, 1873.

SIR: I beg leave to call the attention of the Department to the gallantry, good conduct, and good judgment displayed by Lieut. W. H. Brownson upon the occasion of the boat expedition under his charge from the Mohican, as detailed in my report under date of June 19, 1870, and respectfully to suggest that a few words of commendation from the Department to Lieutenant Brownson and the officers and men of the expedition, indicating the appreciation of the Department of the successful performance of a dangerous and difficult service, would be an encouragement and a satisfaction to themselves and an incitement to others in their career in the service.

I have the honor to be, very respectfully, your obedient servant,

W. W. LOW, *Captain.*

HON. GEO. M. ROBESON,
Secretary of the Navy, Washington, D. C.

NAVY DEPARTMENT, *March* 3, 1873.

SIR: The Department is always pleased in appropriately acknowledging the meritorious services of the officers and seamen of the Navy, and regrets to find, on recurring recently to the circumstances of the destruction of the piratical cruiser Forward, in Tencapau River, January 17, 1870, that it omitted to express to you, and through you to those who composed the expedition under your command, its appreciation of the good judgment, good conduct, and gallantry displayed on the occasion.

It therefore gives it pleasure, even at this remote day, to supply the omission, and to say that the reports of Commander Low, who commanded the Mohican, and of yourself, indicate that promptness, discretion, and bravery marked the expedition from its inception to its termination.

Having, in the appendix to my annual report of 1870, expressed the satisfaction of the Department with the result of the expedition, and published in full the detailed reports concerning it, it is deemed unnecessary to mention here, by name, those who shared with you its dangers and honors, and those who lost their lives in protecting the flag and commerce of the country. Their fidelity and gallantry are unextinguishably recorded in those reports, which have become a part of the nation's history.

To you and all others concerned in the expedition, the Department expresses its grateful acknowledgments.

Respectfully,

GEO. M. ROBESON,
Secretary of the Navy.

Lieut. W. H. BROWNSON,
Naval Academy, Annapolis, Md.

No. 280.] UNITED STATES NAVY-YARD, NEW YORK,
Commandant's Office, November 8, 1873.

SIR: I have the honor to forward herewith, for the favorable consideration of the Department, a letter from Lieutenant Schetky, addressed

to Captain Low, and by him referred to me, commending the conduct of John Dempsey, ordinary seaman, belonging to the crew detailed for the Kearsarge.

I respectfully suggest that a medal of honor would be a suitable recognition of Dempsey's gallantry and good conduct.

I am, very respectfully, your obedient servant,

S. C. ROWAN,
Vice-Admiral, Commanding.

HON. GEO. M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES RECEIVING-SHIP VERMONT,
Navy-Yard, Brooklyn, November 6, 1873.

SIR: I have the honor to report the following case of good conduct and bravery on the part of John Dempsey, ordinary seaman:

While on board the United States tug Rocket, waiting transfer to the Pacific mail-steamer Grenada, for transportation to Mare Island, California, having been drafted for the United States steamer Kearsarge, James Hayes, ordinary seaman, accidentally fell overboard, and being unable to swim, was in danger of drowning. John Dempsey, without hesitation, sprang overboard and supported Hayes until a line could be passed him, when both were safely landed on board the tug.

Very respectfully, your obedient servant,

C. A. SCHETKY,
Lieutenant United States Navy.

Capt. W. W. Low, U. S. N.,
Commanding U. S. Receiving-Ship Vermont, Navy-Yard, Brooklyn.

No. 61.] OFFICE COMMANDER-IN-CHIEF SOUTH PACIFIC STATION,
UNITED STATES FLAG-SHIP PENSACOLA, (2d rate,)
Bay of Coquimbo, Chili, August 22, 1873.

SIR: It is with pleasure I forward the inclosed copy of a report made by Capt. John H. Upshur, detailing the gallant conduct of Patrick Regan, ordinary seaman, in saving a shipmate from drowning, and beg that the Department may be pleased to notice his conduct.

Very respectfully, your obedient servant,

CHARLES STEEDMAN,
Rear-Admiral United States Navy,
Commanding United States Naval Force, South Pacific Station.

HON. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

SOUTH PACIFIC STATION,
UNITED STATES FLAG-SHIP PENSACOLA,
Harbor of Coquimbo, Chili, July 30, 1873.

SIR: I am pleased to call your notice to the brave and honorable conduct of Patrick Regan, ordinary seamen of this ship, in saving a shipmate from drowning.

During the prevalence of a "norther" at this port this morning Peter Linguist, ordinary seamen, fell from the lower boom, when attempting to come on board from one of the ship's boats. As he rose from the water the boat struck him on the head and stunned him. He had large top-boots on, and was otherwise heavily clothed, and, becoming insensible, Linguist was drowning.

At that moment Regan observed the accident from the gun-deck, and he at once jumped out of a port, and swam to the rescue, and had the happiness to save the man's life.

Though in humble life, the man Regan has been truly noble, and I am sure you will commend his conduct.

Very respectfully, your obedient servant,

J. H. UPSHUR,
Captain, Commanding.

Rear-Admiral CHARLES STEEDMAN, U. S. N.,
Commanding United States Naval Force, South Pacific Station.

NAVY DEPARTMENT, *Washington, October* 6, 1873.

SIR: Rear-Admiral Steedman, commanding the United States naval force on the South Pacific station, forwarded to the Department, August 22 last, a report made by Capt. J. H. Upshur, commanding the flag-ship Pensacola, of your brave and honorable conduct in saving a shipmate from drowning.

The Department is pleased to hear of your heroic, humane, and successful efforts, which will be mentioned in a general order.

A medal of honor will be given you.

Very respectfully,

WM. REYNOLDS,
Acting Secretary of the Navy.

Mr. PATRICK REGAN,
Ordinary Seaman, United States Steamer Pensacola,
South Pacific Station.

No. 52.] UNITED STATES FLAG-SHIP LANCASTER, (2d rate,)
Rio de Janeiro, Brazil, October 24, 1872.

SIR: I have the honor to inclose herewith a copy of a letter from Captain Caldwell, of this ship, in regard to the gallant conduct of James A. Rodney, ordinary seaman, and John O'Brien, seaman, who jumped overboard to assist a man who fell from aloft and was severely injured. In my opinion, the conduct of the former probably saved the life of the injured man.

I beg leave to suggest to the Department the propriety of noticing, in some public manner, the conduct of the two men named above.

I am, sir, very respectfully, your obedient servant,

WM. ROGERS TAYLOR,
Rear-Admiral, U. S. N., Commandiny United States Naval Force,
South Atlantic Station.

Hon. GEO. M. ROBESON,
Secretary of the Navy.

UNITED STATES FLAG-SHIP LANCASTER, (2d rate,)
Rio de Janeiro, Brazil, October 22, 1872.

SIR: I have respectfully to report that while furling sail Charles Beckman, seaman, fell from aloft, struck a gun in his descent, which inflicted a severe wound on his head, and then tumbled overboard. Immediately on his striking the water, James A. Rodney, ordinary seaman, very gallantly jumped overboard and brought the wounded man to the grab-rope, and supported him there until a boat could be sent to his assistance. John O'Brien, seaman, also jumped overboard and rendered timely assistance.

Very respectfully, your obedient servant,

C. H. B. CALDWELL,
Captain.

Rear-Admiral WM. ROGERS TAYLOR, U. S. N.,
Commanding United States Naval Forces, South Atlantic Station.

I hereby certify that the above is a true copy.

JOHN F. BUST,
Clerk South Atlantic Station.

UNITED STATES STEAMER, POWHATAN, (2d rate,)
Norfolk Harbor, Virginia, December 27, 1872.

SIR: I have the honor to bring to the notice of the Department the gallant conduct of Joseph B. Noil, seaman, (negro,) one of the crew of this vessel.

The circumstances are as follows: On yesterday morning the boatswain, I. C. Walton, fell overboard from the forecastle, and was saved from drowning by Joseph B. Noil, seaman, who was below on the berth-deck at the time of the accident, and hearing the cry "Man overboard," ran on deck, took the end of a rope, went overboard, under the bow, and caught Mr. Walton, who was then in the water, and held him up until he was hauled into the boat sent to his rescue.

The weather was bitter cold, had been sleeting, and it was blowing a gale from the northwest at the time.

Mr. Walton, when brought on board, was almost insensible, and would have perished but for the noble conduct of Noil, as he was sinking at the time he was rescued.

Very respectfully, your obedient servant,

PEIRCE CROSBY,
Captain, Commanding.

Hon. GEO. M. ROBESON,
Secretary of the Navy, Washington, D. C.

Respectfully forwarded.

C. H. DAVIS,
Rear-Admiral and Commandant.

UNITED STATES STEAMER POWHATAN, (2d rate,)
Key West, May 16, 1873.

SIR: I beg leave to bring to the notice of the Department the heroi conduct of Francis Gallagher, landsman. The facts are as follows: On

the 29th of April, while swaying aloft top-gallant yards, the jack-block through which the fore-top-gallant-yard rope was run—carried away, striking Francis Gallagher, landsman, and Thomas Dyer, coxswain, who were at the time standing on the top-mast cross-trees, and injuring them severely. The latter, Dyer, lost his balance, and was in the act of falling, when Gallagher, notwithstanding he was severely hurt, by his great presence of mind, caught Dyer and held him until assistance could be sent.

Had it not been for the instantaneous action of Gallagher, Dyer would have, without doubt, been killed by falling to the deck.

Very respectfully, your obedient servant,

PEIRCE CROSBY,
Captain, Commanding.

Hon. GEO. M. ROBESON,
Secretary of the Navy, Washington, D. C.

UNITED STATES FLAG-SHIP WABASH, (1st rate,)
Ville Franche Harbor, November 13, 1873.

SIR: I have the honor to inform the Department that while this vessel was moored in Barcelona Harbor on the 5th of October, 1873, Patrick Sullivan, quartermaster, rescued from drowning Frank Westphale, ordinary seaman.

The circumstances were as follows: While one of the stern-boats was being hoisted the after-fall unhooked, and the boat fell about 20 feet to the water. There were two men in the boat at the time, one of whom, Westphale, was unable to swim. He made vain efforts to keep on the surface, and could just be seen beneath the surface struggling, but gradually sinking, when Patrick Sullivan went down the stern-ladder, dropped into the water, grasped him and held him until a rope was thrown him. About the same time a boat from Her Britannic Majesty's steamer Pallas, which was lying close to us, reached the spot.

I would also state that Frank Davis, one of the crew of the Pallas, seeing the men struggling in the water, jumped overboard and attempted to reach the spot in time to be of assistance.

I am, sir, respectfully,

S. R. FRANKLIN,
Captain, Commanding.

Hon. GEO. M. ROBESON,
Secretary of the Navy, Washington, D. C.

No. 17.—REPORT OF ADMIRAL PORTER.

WASHINGTON, D. C., *October* 22, 1873.

SIR: I have the honor to state that since my last report ten ships of war have been inspected before going to sea and found to be properly fitted out, and in nearly every case an improvement over the previous year.

I do not know that anything more is to be desired in the manner of preparing vessels for sea, except that further facilities for saving life should be provided.

I have not yet heard of any ship in commission that had the means, in case of fire or other accident, of providing for the safety of her crew by boats or life-rafts, for it is quite certain that in the hurry of a fire or collision proper rafts could not be improvised.

The last thing at an inspection is to see what facilities a ship has for saving her crew, a much more important problem at present than in former times, when torpedoes were not used in naval warfare, yet, as I said before, in no instance has a United States vessel been found provided with the means of saving those on board, and our boats are, for this purpose, in many instances even inferior to those of ocean passenger steamers.

I have referred to this important subject in several reports to the Department, and again recommend that it receive the attention it merits.

No ship can carry boats enough to save her crew in a heavy sea, but life rafts can be fitted in such a way as not to encumber the vessel or injure her appearance, and with their aid the entire ship's company could be saved.

Some officers object to those life-saving appliances as unsightly, and make any excuse to leave them behind; and the gutta-percha rafts are stored away in boxes unused, and without ventilation, until they become unserviceable.

I would therefore recommend that every vessel in the Navy should have a monthly exercise, to test the efficiency of the means at hand for transporting the crew, the result of which should be reported to the Department. I venture to say that at every trial some useful experience will be gained, and in case of the destruction of any of our ships by torpedoes, the good effects of such practical experiments would be seen.

The best life-rafts are those of Commodore Ammen, Mason & Rogers, Torrey's Gutta-Percha, and the Hammock Life-Preserver, the latter recommended by Mr. R. B. Forbes, a gentleman who, at his own expense, has undertaken experiments in life-saving apparatus which should properly be conducted by the Government.

These experiments of Mr. Forbes's have shown the way to save life at sea under all circumstances, and if the results are adopted they will prove very satisfactory to those who have to encounter the perils of the ocean.

Nine ships have been inspected on their return from sea, and all were found in creditable condition. This speaks well for the commanders and officers, who have had a pretty hard time in maintaining discipline among the cosmopolitan sailors who man our ships, with rules scarcely stringent enough even for times of peace.

CREWS.

In examining the quarterly returns of inspections, I find the universal excuse for deficiencies "shortness of crew," and although in some cases this excuse is hardly admissible, yet, on the whole, our ships' companies are about 15 per cent. below the complement, which should not be the case with vessels of war.

The calculations for our ships' crews have already been very closely made without, as in former times, allowing any supernumeraries. Consequently the loss of ten working-men will be felt even in the largest of our vessels, and a single man would be missed in a small one. Yet, if a commanding officer should experience defeat owing to the shortness of his crew, I fear he would meet with little sympathy on that account.

In my last report to the Department I nearly exhausted this subject; but as no remedy to the growing evil has yet been applied, I again beg

leave to suggest that some legislation be procured from Congress for properly manning the Navy, both as regards numbers and material.

After careful study and many years' experience at sea, I adhere to the opinion heretofore expressed from time to time in my reports to the Department, that an apprentice system, based onthe plan I lately submitted to you, should be adopted for the service.

It has hitherto been thought that our merchant-marine would be a school from which we could always recruit seamen, whereas the Navy is now actually the school from which merchants obtain their best men, and the wages in the mercantile marine are so much better than those in the Navy that no inducements held out by the latter are sufficient to keep men in the Government service.

Seamen naturally go where they can get the highest pay. They find the merchant service more remunerative and more desirable than the Navy, which men enter deeply in debt for an outfit which should be furnished them free of cost.

It is possible that, after adopting the apprentice system now existing in the British navy, we might at the end of five years' apprenticeship, still be furnishing men for the merchant service, but in time of war we would get them back again, and would then experience the benefit of having seamen educated in the Navy and attached to their country and flag.

In all probability a large number of apprentices would elect to remain in the naval service and enjoy the benefits arising from continuous employment.

At all events, no harm could result from the adoption of the apprentice system, and we should secure a larger number of native Americans than are at present in service, for frequently on the return of a United States vessel from a cruise, about the only nationality she has is in her officers and the flag flying at her peak.

My last report was very full upon this subject, and gave indisputable facts to corroborate what I now write.

BATTERIES OF VESSELS.

I beg leave to call your attention to a defect in some of the smaller vessels which has on several occasions been noticed by the inspecting-board, and which is obvious to naval officers generally; that is, the batteries are too heavy for the vessels and the guns too large for the breadth of beam. This applies more particularly to the nine-inch guns on board vessels of the Plymouth class, and those of smaller tonnage. The breadth of beam does not allow the working of the nine-inch guns to advantage, and in time of action they would be knocked to pieces against the coamings. Without referring to other disadvantages, I recommend that a suitable eight-inch gun be substituted for the nine-inch.

There is but little difference in the weight and range of the eight-inch shot, and its effects against a wooden vessel would be almost as destructive as the nine-inch. Neither gun would have any effect against an ordinary iron-clad unless accidentally striking some very vulnerable part.

Some of the vessels to which I have alluded could probably carry a couple more of the eight-inch guns in consequence of their lighter weight, owing to a decrease of caliber. The eight-inch gun could also be more rapidly handled with a smaller number of men, and in my

opinion at ordinary range, ten eight-inch would be superior to eight nine-inch guns.

It is a disputed point with some officers what constitutes heavy guns, but an eight-inch should certainly be considered in that category, as it is one of the favorite pieces of the service, and only a few years ago but four of them were placed on board our largest frigates.

STEAM CAPSTANS.

In my last report I drew your attention to the want of steam capstans in the navy, and gave reasons for their use. I recommend their adoption in the ships now building, for no ships of war can be thoroughly efficient without them.

I also mentioned the necessity of building more buoyant steam-cutters, of models better adapted to a heavy sea, such as they are often obliged to encounter. The machinery and boilers of our cutters are now all that is required and are capable of driving boats of larger size.

ALLOWANCES OF OFFICERS.

Of late years some improvements have been made in the cabin allowances of our naval vessels, but the increase in the cost of living abroad causes officers to incur expenses far beyond their means, and at the end of a cruise they are often deeply in debt.

The pay of officers may appear liberal to those living in retired places, but when it is remembered that an officer has to provide for his family on shore during his absence from home, and accept and return the hospitalities of foreign officials without any allowance from Government, a different opinion must prevail.

Naval men are proverbially hospitable, and European governments, desiring their officers to be so, afford them the necessary means. The cabins are provided with the requisite furniture, and the tables fitted even to the smallest particulars. Our policy should be equally liberal. Such a system makes an officer very independent, enabling him to leave home, at a moment's notice, to join a ship in any part of the world, without encumbering himself with troublesome effects and going to an expense he can ill afford.

To show the difference between the pay of our own and foreign officers, I will compare the grades of rear-admiral in the navies of the United States and Great Britain.

The pay of an officer in the British navy is given for the support of himself and family, but to prevent the commander of a vessel being put to pecuniary inconvenience, thereby impairing his usefulness, the government allow table-money and other emoluments.

Thus, a rear-admiral or commodore of the first class receives $5,475, with an allowance of $8,210 for table-money, servants, &c., amounting in all to $13,685 per annum, or more than twice the full pay of one of our rear-admirals afloat.

This difference is still greater when it comes to the pay of higher officers. For instance, an admiral of the fleet receives $19,160, and a vice-admiral $15,510, beside other allowances.

In addition to the above, all commanding officers are allowed table-money for entertainments, which enables them to leave a sufficient amount of pay at home to support their families.

From this it will be seen how inadequate would be considered by other governments the pay of our commanding officers.

I doubt if we have an admiral, captain, or commander afloat who is not sorely pinched on account of the various calls upon his hospitality, and duty on shore is so much more agreeable and less oppressive that officers naturally hesitate to seek sea-service.

Some may urge that our officers abroad are not obliged to incur these expenses; but it would not look well for the commander of a United States vessel of war, after partaking the hospitalities of foreign officers, to get up his anchor and steam out of port to avoid reciprocating.

Courtesies between officers tend to cement the bonds of good feeling which nations should experience towards each other, and they should therefore receive the greatest encouragement.

On two occasions within my knowledge, the Department of State has paid out some $10,000 to enable the commanding officer of the European squadron to return civilities and do honor to our country, and these precedents it would be well to follow. It is not just that officers out of a pay only sufficient for the support of themselves and families should be subjected to any expense in returning hospitalities which are absolutely of a national character.

I speak in behalf of the Navy, having no personal interest in the matter, and trust that a liberal view will be taken of the subject and every possible allowance made to prevent our officers abroad from being placed in embarrassing positions and subjected to unnecessary expense.

This subject naturally belongs to Congress, but the Navy Department can in a measure regulate the matter of allowances and add to the comfort of commanding officers abroad as well as those in command of shore stations.

FLAGS.

A petition has been numerously signed by officers of the Navy, including myself, asking that the flags of Admiral, Vice-Admiral, and rear-admiral which were in use during the late war, together with the old broad pendant, be restored to the service to take the place of the flags now worn. The present flags are distasteful to the officers and men, and do not afford the distinction between grades that they were originally intended to effect.

There are traditions connected with the old flags that are dear to the officers and men who served in the war for the Union, and we do not wish to relinquish those familiar objects.

Admiral Farragut was allowed to retain the flag under which he had gained his renown, but at his death it was abolished, and the Navy now asks that it may be resuscitated. The younger officers now coming forward will look up to the old flag with more pride than to the one at present in use, which signifies nothing at all.

It was incorrectly supposed, at the time the change of flags was made, that I was responsible for it, but I never liked the new flag. The alteration was, however, deemed advisable by the chief of Bureau having charge of such matters, on the ground that the new flag would assimilate with the uniform system adopted by foreign nations. This was a fact, but as there was a national sentiment connected with the old flag, I think the substitution unadvisable.

The new flag having been tried for some years, and giving no satisfaction, the officers of the Navy petition strongly for the change, which I trust you will grant.

TORPEDOES.

The torpedo system has occupied my particular attention during the past year, and although much engaged in matters relating to the build-

ing of the new torpedo vessel, I have yet found time to investigate the experiments made in other quarters.

I am confirmed in my opinion that the torpedo system, although still in its infancy, is destined to play a most important part in future naval warfare, so that the nation most advanced in torpedo science will possess great advantages over all others.

To us, who seem to experience so much difficulty in maintaining a Navy, it is absolutely necessary that we should devote more time and attention to the subject of torpedoes than other nations, and make a liberal outlay for this purpose.

I regret to say that there is much less interest displayed in this question, in our Navy, than its importance deserves, for I know of but two vessels that have gone to quarters and fired their torpedoes the same as if in action.

I am convinced that proper attention will not be given to this subject until special instructions are issued from the Department.

Although the theoretical instruction hitherto given at the torpedo station has been of a very interesting kind, I think a larger amount of practical experiments could be substituted for it with advantage. Officers would naturally feel more interest in actual practice than in mere theory. I have conversed with several who have been under instruction at the station, and although they express themselves pleased with the information they have gained, they seem on the whole not sorry to have (as they suppose) "finished with the business."

In my opinion, no one can make a good torpedo officer unless his heart is in the work, and hence I believe it well to make the duty as attractive as circumstances will admit.

At present the torpedo station is a theoretical school without sufficient practice, and the experiments are not altogether suited to impress the students with the importance of the work on which they are engaged. I am pleased to say, however, that some very good and useful practice has lately been had at Newport while fitting the Monongahela, which will do more to impress the officers and crew of that ship with the power of torpedoes than anything else could have done.

A number of officers would like to go to Newport for instruction, but some of the rules of the station seem to them inconsistent with the relations that should exist between seniors and juniors where the latter are superintendents and instructors.

Now, in foreign navies—in that of England, for instance—torpedo instruction is under the immediate supervision of a rear-admiral or other officer of rank, who has the opportunity of selecting the best talent in the service as assistant instructors. Two rear-admirals, ten commodores, and a large number of captains and commanders are now under instruction in the British navy, and seeing the difficulty in the way of our future progress, I recommend that a like course be pursued by us.

Among all the officers who have studied at the torpedo station, I have met with no one who had invented anything or proposed any improvement on what has been done before. I think this is because they are not sufficiently interested. It should be the policy to encourage an officer to use all his faculties to bring the torpedo system to perfection.

In my several visits to the torpedo-station during the present year, and during my sojourn there of two months, it was evident to me that the means of practical instruction were inadequate. There are only two or three small launches attached to the station, which are not at all suited for the work, and there is no course of instruction whatever for defense against torpedoes.

It is evident that to make the torpedo-school what it should be a more liberal expenditure is required, and the cost of one small ship of war annually for this purpose would be money well spent.

There should be added to the present means of instruction four large steel launches, each 50 feet in length and 10 feet beam, with double screws for quick manœuvering, and all other modern appliances; also the different kinds of torpedoes for harbor defense, the various nets and spars for the protection of vessels against torpedoes, and a good monitor from which to send off the Lay torpedo; for I do not believe ships will come close enough to port to be injured by that device, and we must consequently go off shore to attack them.

In addition to the above, there should be sections of ships, or iron buoys made equally as strong, to test the effect of the different torpedoes fired from the water level to 20 feet below. Specimens of all foreign torpedoes should be bought and tested, and preventives applied against their attack.

Such contrivances as prove good we should adopt into the Navy, and teach our officers how to encounter and use them under all circumstances.

I merely make these suggestions without going into details; but the liberal expenditure of money in this matter of torpedoes would no doubt give birth to many devices not thought of at present.

A great deal of importance has been given to the Harvey torpedo, the Fish torpedo, and the Lay torpedo, and the probability of their destroying ships under all circumstances.

No doubt these inventions are formidable to a certain extent; and a commanding officer, ignorant of the manner in which their attack should be met, would be in danger of losing his vessel; but with an understanding of the subject, and a vessel of equal speed, either of the torpedoes mentioned could be eluded and destroyed.

No towing, diving, or swimming torpedo yet invented is a match for a smart ship, properly armed, with her crew at the guns; and it is for this reason that I recommend the construction of so many large launches to teach officers how to maneuver in attacking and repelling the attacks of torpedoes or torpedo vessels.

Officers would soon find out the difficulty of destroying a ship, properly handled, by means of towing torpedoes, unless the latter were hidden, although it might be easy to blow up a vessel not on the alert, or one improperly handled.

A vessel of equal speed need have little fear of an opponent carrying either the Harvey or Fish torpedo; for these inventions can only be successfully used against ships taken by surprise or lying at anchor.

As a protection against such contrivances I would recommend that all our ships be supplied with 24-pound howitzers to fire at them over the stern and quarter when coming up, or down upon their decks when close on board. An intelligent commander would naturally bring either of these torpedoes astern of his vessel, which it is easy to do in daylight, no matter from what direction they may approach. If from ahead, he can turn on his heel. If from abeam, he can change his course eight points, and the Harvey torpedo-vessel, with all her reels and towing-lines, deck crowded with men, &c., would soon be *hors du combat* unless proof against shot, which could hardly be the case, for a torpedo boat must be light, and able to maneuver quickly.

In fights between two or more ships, as the vessels are always enveloped in smoke, these torpedoes will be extremely formidable, and it will require great ingenuity to guard against their attacks; but the

practice I recommend of maneuvering in steam-launches will teach officers how to provide for every contingency.

Any ship can be arranged with a heavy net all around, from the bowsprit end to the end of the spanker-boom, which, fastened to her lower yards, (the yards resting on the gunwale,) can be kept triced up and dropped just before the Harvey or Fish torpedo gets within striking distance. The torpedo would explode 20 feet from the ship, doing no harm except to the net, which should be of nine-thread ratlin-stuff, with meshes sufficiently small to prevent the torpedo passing through the interstices.

Here, then, is a most important experiment to be tried.

The net-work is the only certain defense a ship can have against anything that dives, although it is a poor protection against a torpedo at the end of a bar, connected with a properly-constructed torpedo-vessel, with appliances for cutting through obstructions.

Such a torpedo-vessel will be the most dangerous to deal with, for there will be no chance to avoid her unless with superior speed. With iron decks and men all under cover, grape-shot would do little damage, and offering but a small target, solid shot would seldom strike the torpedo-vessel, especially at night or in a fog.

Yet all these matters are problems to be worked out only by actual experiment, and we are solving them too slowly.

In the late experiments conducted on board the United States steamer Monongahela, where a hulk was blown up by a spar-torpedo, the ship running for the quarter of the hulk, two large pieces of timber containing several bolts were thrown back on board the ship, together with some smaller fragments. To avoid casualties at such times every ship in the Navy should carry a rope-splinter netting as a portion of her regular outfit.

I feel that I am touching a delicate matter when I refer to the question as to how far naval jurisdiction extends in the protection of our coasts and harbors with torpedoes.

No matter how well drilled a soldier may be, he is never as much at home in a boat or on shipboard as a seaman, nor can an Army officer as well direct the management of a boat or vessel as an officer of the Navy. Torpedoes planted to defend the harbor should be laid down by men accustomed to boats and skilled in the management of lines and tackles. Along the open coast or on the ocean, torpedo duty must of necessity fall to the lot of the Navy.

During the late war the torpedo duty of the enemy afloat was in the hands of rebel naval officers, who managed it with great success, taking into consideration the small means at their command.

In time of war the duty of the soldier defending a harbor is behind the fortifications, to protect with the fire of his guns torpedoes planted to obstruct the channel, for torpedoes unprotected by guns on shore would be of little use, and guns on shore would not prevent the passage of vessels without torpedoes; but in handling torpedoes in boats, in all weathers, seamen alone can be relied upon.

The question then arises, will not the Navy, in the event of war, be called upon to protect our coasts by torpedoes, and ought there not to be a system adopted and provision made to meet future emergencies?

In some countries there is a torpedo-corps, composed of officers and men taken from the Navy, whose sole duty it is to look after the coast and harbor defenses.

I am strongly in favor of such a corps in our Navy, with a permanent

head, the junior officers to serve a length of time equal to that served at sea or on other duty.

The organization of a suitable torpedo corps will necessarily be from the Navy, for the reasons I have stated, and as it will eventually become a very important part of our naval system, we should take advantage of the present opportunity and commence the establishment. It will be rather late when war breaks out to discuss a matter already plain enough to those who have examined the subject, for the enemy would pass the gates while the argument was going on.

In my opinion it is simply the duty of the Army to fire torpedoes from the stations after they have been planted. For this the Army should have the proper appliances, and every means for knowing the arrival of an enemy's vessel over a torpedo-nest.

I have said so much on this subject to show that to the Navy the most important torpedo appropriation, for operating on the water, should be made, and for those torpedoes used on land the appropriation should be given to the Army. Common sense would, indeed, point out that the defense of harbors and coasts, where there are often dangerous bars, reefs, and breakers, with any description of torpedoes in any way connected with a vessel, should be in the hands of the Navy.

A line should be drawn between the duty of the Army and Navy, where one terminates and the other commences, otherwise there will be confusion.

EXERCISES.

I would respectfully call your attention to the fact that the quarterly returns of exercises on shipboard are not as full as the regulations require, or as is desirable for the purpose of maintaining efficient drill. No ship can be a thorough man-of-war unless perfect in all exercises and ready for any emergency. A vessel going into action should be able to strip for the fight in a few moments, for with all her top hamper up and rigging rove she runs the risk of fouling her propeller should a mast be shot away, and crippling her guns by falling spars. Now that battles are fought under steam, there is no longer any necessity for spars aloft in time of action, but constant exercises are necessary to make a ship thoroughly efficient.

Upon one occasion, while in command of the Naval Academy, I saw a sloop-of-war with royal-yard across, rigging rove and sails bent, stripped to her lower rigging, and her rigging all tallied, in seventeen minutes, and this the work of young midshipmen without previous preparation. I have frequently seen the same thing done in half an hour, but I hardly think any of our ships now in commission can do as well.

The reasons assigned by commanding officers for not performing all the exercises do not always seem to me valid, and frequently no explanation at all is given of omissions.

Many complaints are made that the iron-work on board our ships gives way during the exercises, and this is offered as an excuse for not sending up and down top-masts and lower yards, for of course no commanding officer should risk the lives of men on doubtful hooks or bolts.

But there is a simple remedy for this, which is to have every bolt, bar, and hook tested to see what it will bear, and a test-mark put upon it.

When iron breaks it is always the case that it had previously been held together by only about one-fifth of its thickness, the fault of bad forging.

Ships stationed in the tropics have neglected their exercises on the ground of the excessive heat making them oppressive to the crews, but few of the evolutions occupy more than ten minutes, and if the crews are called to quarters daily, cast loose, run in and out the guns and secure, it will do no one any harm.

The sending up and down topgallant yards and masts requires not more than three minutes in the cool of the morning and evening, loosing and furling sails require at the most three minutes, and the sails are quite as well preserved on the yards as in a sail-room, where they are apt to mould and rot. I think these things will strike intelligent officers as they do me.

Upon the whole the exercises as far as they go, considering the shortness of our crews, are fairly performed, but in indorsing the reports of commanding officers, I am obliged to be governed by what is stated therein.

UNIFORM OF SEAMEN.

I notice that the clothing of our seamen does not yet conform to regulations, and that some officers alter it to suit their own taste, which they are not authorized to do.

The present uniform is appropriate, is as inexpensive as it can be made, and clearly indicates the several distinctions among the sailors; yet I have seen the boats' crew of a ship some time in commission wearing three different varieties of uniform, none of them regulation.

The only change I would recommend in the uniform is the abolition of the dungaree collar, now worn on the blue-flannel shirt, and the substitution of blue nankin on the collars of white frocks, in place of dungaree, which changes in washing to all the colors of the rainbow.

STEAM DEPARTMENT.

The seamen-firemen and seamen-coal-heavers substituted in place of the old rates of firemen and coal-heavers, do not like the duty assigned them when steam is raised. The work is unpopular because, as a rule, steam is seldom used, and the extra pay allowed for these occasions will not even compensate for the clothing worn out.

Firemen and coal-heavers being, as one may say, regular denizens of the lower regions in a ship of war, have stow-holes, or boxes, allowed them in which to keep their steaming and coaling clothes, but a seaman has only his bag, which contains his best apparel, and he cannot provide for this extra steam duty.

The result is that most of the seamen-firemen and seamen coal-heavers desert, and I would recommend that the system be changed. The duties are so distinct that it is out of the question to make a good fireman out of a sailor.

SCHOOL-SHIP.

Having visited the Naval Academy practice-ship during the past summer, I beg leave to submit a few remarks in relation to that vessel.

Although a fine ship of her class, I do not think her altogether adapted to the purpose for which she is used. The midshipmen are too much crowded together and thrown too much with the crew, which is not desirable.

When the Tennessee is finished she will make an excellent school-ship, and being provided with the best of engines, will afford the midshipmen and cadet-engineers a fine means of instruction in steam.

If she is kept constantly in commission with a picked crew, the ship will be a good school of discipline, and the importance of having everything on board a ship kept in order will be impressed upon the youthful mind. Besides, the midshipmen would, in such a ship, learn more of the routine of the navy in three months than they would in three cruises in a vessel hastily fitted out and with a green crew on board.

I herewith enclose reports of inspection of receiving-ships and the general condition of vessels of the monitor class. Those of this class that have been reconstructed on the plan I recommended are excellent vessels, much more comfortable and efficient than before, and they will be serviceable for many years to come.

I have the honor to be, very respectfully, your obedient servant,

DAVID D. PORTER,
Admiral.

Hon. GEORGE M. ROBESON,
Secretary of the Navy, Washington, D. C.

Washington, D. C., November 6, 1873.

SIR: As an addition to my report, I beg leave to submit the following in relation to monitors.

Since my last report the Saugus has been completely repaired as recommended, is now an excellent vessel, and is at sea.

The Manhattan has been repaired in a similar manner, and can be got ready for sea in a short time.

The Wyandotte and Nahant are being repaired, and will be finished in six months.

The Canonicus, being repaired in a similar manner, will be ready in three months.

When finished, all the above-named vessels will be much improved, and will last for many years with very few repairs.

The following named vessels of the Nahant class, now at League Island, should be repaired in the same manner as those before mentioned, as they have good hulls and machinery, although rotten in their woodwork: Nantucket, Catskill, Jason, Lehigh, Passaic. These vessels can be repaired in six months by giving the work to separate firms, and would cost $180,000 each.

I beg leave to renew my recommendation with regard to the Puritan. She has a fine hull, and if finished on the new plans will make an admirable monitor and ram.

I also recommend that the Terror, one of the finest vessels in the Navy, be rebuilt with an iron hull, which could be done in seven months.

At Boston navy-yard, the light draught monitors Shawnee and Wassuc should be repaired like the rest, at a cost of $140,000, each.

The Mahopac, at Norfolk, could be ready in a month at a cost of $1,000. She is a fine vessel since the alterations were made in her.

The monitor Amphitrite, at the Naval Academy, was originally one of the most formidable vessels in the Navy, and though deficient in steam power has a good hull and turret. She could, with an outlay of $180,000, be made a most powerful vessel.

The Dictator, at New London, also requires repairs without delay. She is one of the best vessels we have, and would make a powerful ram.

With the monitors thus repaired, we could defend our ports against any ordinary enemy, and the work I have proposed on these vessels would not be too much to undertake at one time.

RECEIVING-SHIPS.

I have examined into the condition of the receiving-ships, and find them kept in as good order by their commanding officers as circumstances will admit. Some of them, however, require a thorough overhauling and repairing to make them comfortable and efficient.

A suitable place should be provided on board for the examination of recruits, and for this reason, if for no other, the sick-bay should be placed on the gun-deck of a frigate, and the upper gun-deck of a ship of the line.

Bath-rooms should also be provided for the ablutions of recruits when they come on board. This is indispensable, as the recrits nearly always present themselves in a condition too filthy for physical examination.

The sick-bays should be enlarged, as none of them will now accommodate more than fifteen patients.

The receiving-ships are properly heated in winter, and in that respect are comfortable.

Respectfully submitted.

DAVID D. PORTER,
Admiral.

Hon. GEORGE M. ROBESON,
Secretary of the Navy.

Sch

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House documents

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